Alternatively, comments can be sent electronically to: sbryant@spl.usace.army.mil

Evaluation Factors

The decision whether to issue a permit will be based on an evaluation of the probable impact including cumulative impacts of the proposed activity on the public interest. That decision will reflect the national concern for both protection and utilization of important resources. The benefits that reasonably may be expected to accrue from the proposal must be balanced against its reasonably foreseeable detriments. All factors that may be relevant to the proposal will be considered including the cumulative effects thereof. Factors that will be considered include conservation, economics, aesthetics, general environmental concerns, wetlands, cultural values, fish and wildlife values, flood hazards, flood plain values, land use, navigation, shoreline erosion and accretion, recreation, water supply and conservation, water quality, energy needs, safety, food production and, in general, the needs and welfare of the people. In addition, if the proposal will discharge dredged or fill material, the evaluation of the activity will include application of the EPA Guidelines (40 CFR 230) as required by Section 404 (b)(1) of the Clean Water Act.

The Corps of Engineers is soliciting comments from the public; Federal, state, and local agencies and officials; Indian tribes; and other interested parties in order to consider and evaluate the impacts of this proposed activity. Any comments received will be considered by the Corps of Engineers to determine whether to issue, modify, condition or deny a permit for this proposal. To make this decision, comments are used to assess impacts on endangered species, historic properties, water quality, general environmental effects, and the other public interest factors listed above. Comments are used in the preparation of an Environmental Assessment and/or an Environmental Impact Statement pursuant to the National Environmental Policy Act. Comments are also used to determine the need for a public hearing and to determine the overall public interest of the proposed activity.

Preliminary Review of Selected Factors

EIS Determination- A preliminary determination has been made that an environmental impact statement is not required for the proposed work.

Water Quality- The applicant is required to obtain water quality certification, under Section 401 of the Clean Water Act, from the California Regional Water Quality Control Board (RWQCB). Section 401 requires that any applicant for an individual Section 404 permit provide proof of water quality certification to the Corps of Engineers prior to permit issuance. The applicant received a Section 401 waiver from the RWQCB on March 10, 2000.

Additionally, the RWQCB directed Southwest Marine (SWM) to develop a site sediment characterization and remedial action work plan to address potentially elevated chemical concentrations in sediments adjacent to the facility. A preliminary sediment characterization of the proposed area identified copper, lead, mercury, zinc, and polychlorinated biphenyls (PCBs) as indicator chemicals of concern. An extensive assessment of these contaminants was initiated in 1998 and completed in 1999. As a result of the assessment, the RWQCB issued Resolution No. 99-12 on March 10, 2000, that requires SWM to remediate soil and sediments to interim specified shipyard sediment cleanup levels. As part of that remediation, 25,000cy of contaminated sediment removal is required from San Diego Bay.

Coastal Zone Management- The applicant has certified that the proposed activity complies with and will be conducted in a manner that is consistent with the approved State Coastal Zone Management Program. This proposed project is located within the San Diego Unified Port District (SDUPD) tidelands and is subject to the SDUPD certified Coastal Zone Master Plan. The SDUPD issued a Coastal Development Notice of Exemption for the proposed project October 22, 1997.

Cultural Resources- The latest version of the National Register of Historic Places has been consulted and this site is not listed. This review constitutes the extent of cultural resources investigations by the District Engineer, and he is otherwise unaware of the presence of such resources.

Endangered Species- Preliminary determinations indicate that the proposed activity would not affect federally-listed endangered or threatened species, or their critical habitat. Therefore, formal consultation under Section 7 of the Endangered Species Act does not appear to be required at this time.

Public Hearing- Any person may request, in writing, within the comment period specified in this notice, that a public hearing be held to consider this application. Requests for public hearing shall state with particularity the reasons for holding a public hearing.

Proposed Activity for Which a Permit is Required

To dredge 25,000 cy of sediment from six separate shipyard locations (approximately 2.49 ac of the total leasehold water area of 17 ac with a 1 ft overdredge allowance), stabilize approximately 40 linear (lf) of riprap shoreline in dredge Area 1 and approximately 150 lf in dredge Area 2 as needed (only riprap that is inadvertently dredged or that slumps into space previously occupied by sediments will be replaced), and upgrade approximately 175 linear feet of Pier 1 which incorporate the fill of 0.77ac (7,500 cy of waters of the United States below the annual high tide line at +7.78 ft MLLW; 12,500 cy total) for additional upland service area at the base of Pier 1 in San Diego Bay (see attached figures).

Additional Project Information

Southwest Marine (SWM) has been a working shipyard since the early 1900's and provided ship repair, conversion, construction, and maintenance. To perform the dredging along the piers and under the dry dock, the ship berths must be empty. Therefore, SWM is limited on the times of year the proposed dredging may be performed.

The dredging of the remediation sites will be performed with a mechanical, clamshell bucket that has a tight seal to minimize turbidity in areas with no obstructions and high solids eddy-flow suction dredging will be used under piers or in the vicinity of underwater obstructions (e.g., marine railways). In addition, a silt curtain shall be employed and placed at a minimum distance of 25 ft from the dredging operations to limit turbidity to the immediate work area, potential impacts to foraging birds, and to minimize impacts to an area of patchy, low-density eelgrass (*Zostera marina*) located offsite approximately 50 ft north of the SWM leasehold. The proposed dredge locations range in bathymetry from intertidal to a depth of approximately 70 ft adjacent to the Southwest Marine drydock.

The dredged material shall be placed on a barge, and transferred onsite to a temporary dewatering facility at the corner of Sampson and Main Streets. In addition, the proposed facility shall be bermed and lined to prevent excess water from returning to the bay. When the sediment is sufficiently dry, the material will be hauled to an approved upland disposal site.

The depth of dredging will vary from location to location between 3 to 9 feet below the existing bay bottom based on the results of the chemical testing program conducted at the facility. The tip elevations of the pilings supporting structures vary from –54 to –89 ft MLLW. Therefore, the pilings appear to be driven to a sufficient depth to prevent failure due to the dredging operation. However, the southern area of the proposed project site has a rock revetment that may fail as a result of deepening the bay bottom. If failure occurs, the applicant proposes to place additional rock on the exposed area for a distance not anticipated to exceed 100 linear feet (lf).

The applicant proposes to dredge in phases to a maximum of 3 phases within each remediation area. Each phase will be completed to the bottom of a core- sampling stratum and followed by confirmation sampling. Phase 1 will consist of dredging the top 2 ft of sediment from all remediation areas. Phase 2 will consist of dredging the next 2 ft of sediment. Phase 3 will remove sediment down to 8 ft or to the Bay Point Formation. Confirmation sampling will follow each phase to verify that sediment exceeding the interim sediment cleanup levels established in WDR 99-12 has been removed.

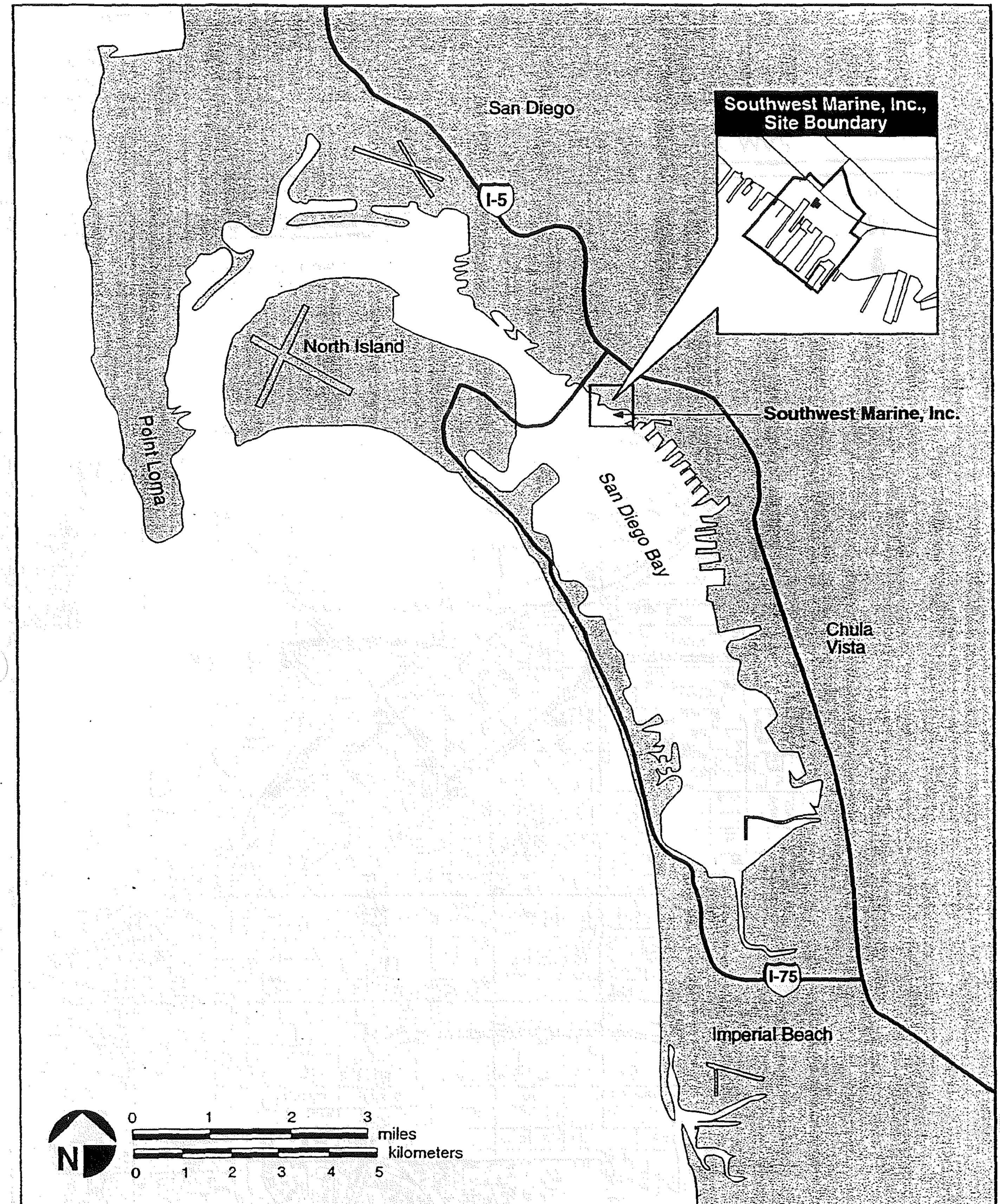
The proposed improvements to Pier 1 and fill to be placed in the nearshore water area on the north and south sides of Pier 1 shall be conducted after the dredging is completed. The improvements include demolition and removal of old, wood sections of the pier and approximately 90 piles (18 inch timber or 16 inch concrete), steel "H" beams and rail line, and replacement with a new concrete causeway, and addition of approximately 50 concrete, 20-inch piles. The fill material will be sand that the applicant proposes to get from the La Paz county Landfill in Arizona, which has been used as fill at SWM in the past. Also, the retrofit will include the construction of a storm water diversion system on the pier to divert storm water to an existing collection system at the facility.

The historical use of the area around Pier 1 is heavy marine industrial and similar uses are planned. The applicant requests comments for a wetlands development project to mitigate for the proposed impacts in this area. The applicant is considering the Tijuana Estuary Project.

Proposed Special Conditions

The permitee understands and agrees that, if future operations by the United States require the removal, relocation, or other alteration, of the structure or work herein authorized, or if, in the opinion of the Secretary of the Army or his authorized representative, said structure or work shall cause unreasonable obstruction to the free navigation of the navigable waters, the permittee shall be required, upon due notice from the Corps of Engineers, to remove, relocate, or alter the structural work or obstructions caused thereby, without expense to the United States. No claim shall be made against the United States on account of any such removal or alteration.

For additional information please call Ms. Shannon K. Bryant of my staff at (858) 674-6784. This public notice is issued by the Chief, Regulatory Branch.



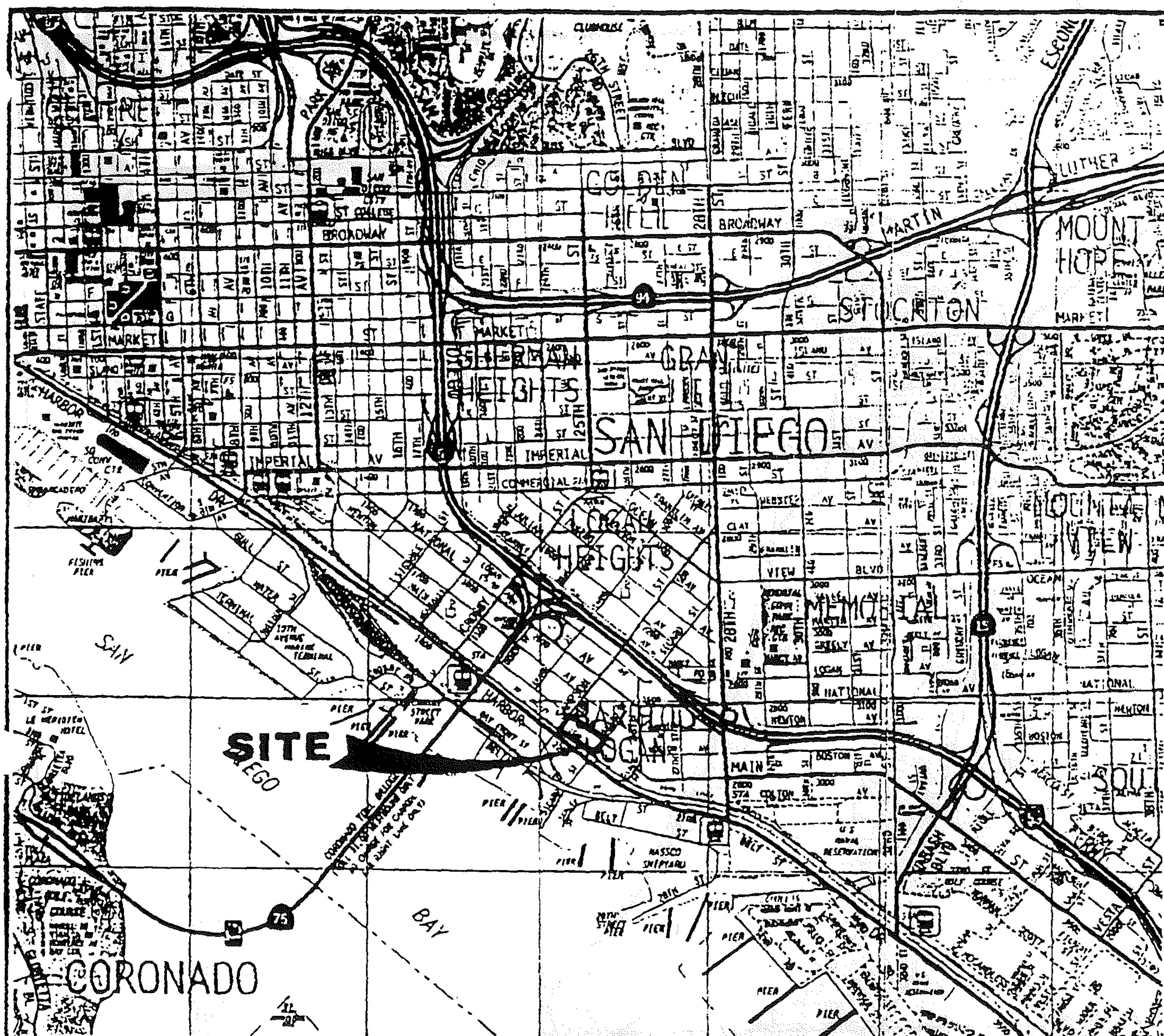
OGDEN

FIGURE

Regional Location of Project Site

1

Bioassay/SWM/Site Location Map.fh7



SOURCE: 1997 THOMAS BROTHERS MAP
SAN DIEGO COUNTY, CALIFORNIA

N
NO SCALE

GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 619 558-6900 - FAX 619 558-6159

VICINITY MAP

SOUTHWEST MARINE PARKING LOT
SAN DIEGO, CALIFORNIA

GWC / JS		DSK / E000D	DATE 12 - 29 - 97	PROJECT NO. 06023 - 22 - 01

1VICMAP

FIGURE 2

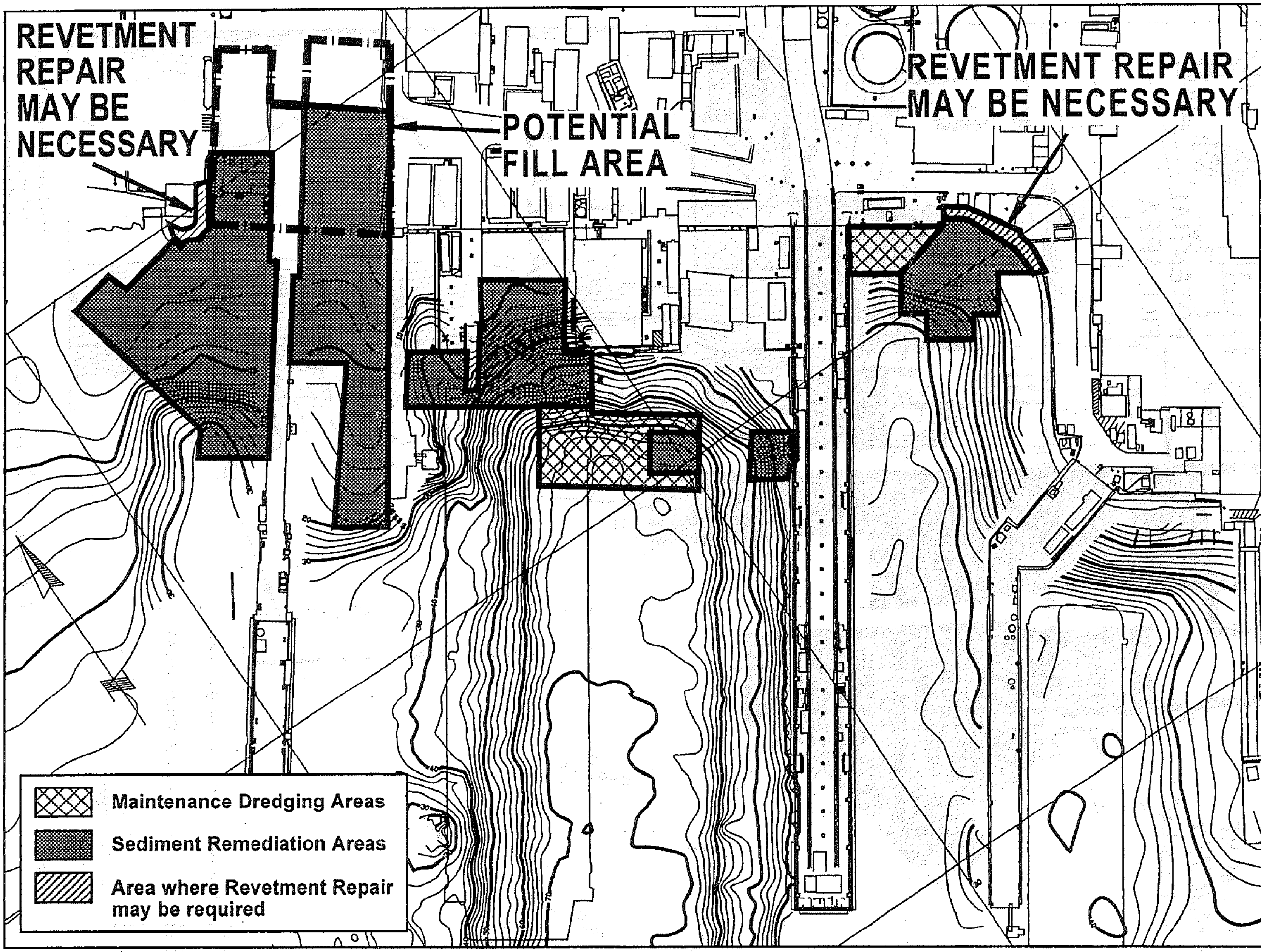


FIGURE 3j

Southwest Marine Sediment Remediation and Maintenance Dredging Areas and Potential Fill Area

Southwest Marine Dredging
San Diego Bay
City of San Diego
County of San Diego, CA
June 2000

EHC 002564

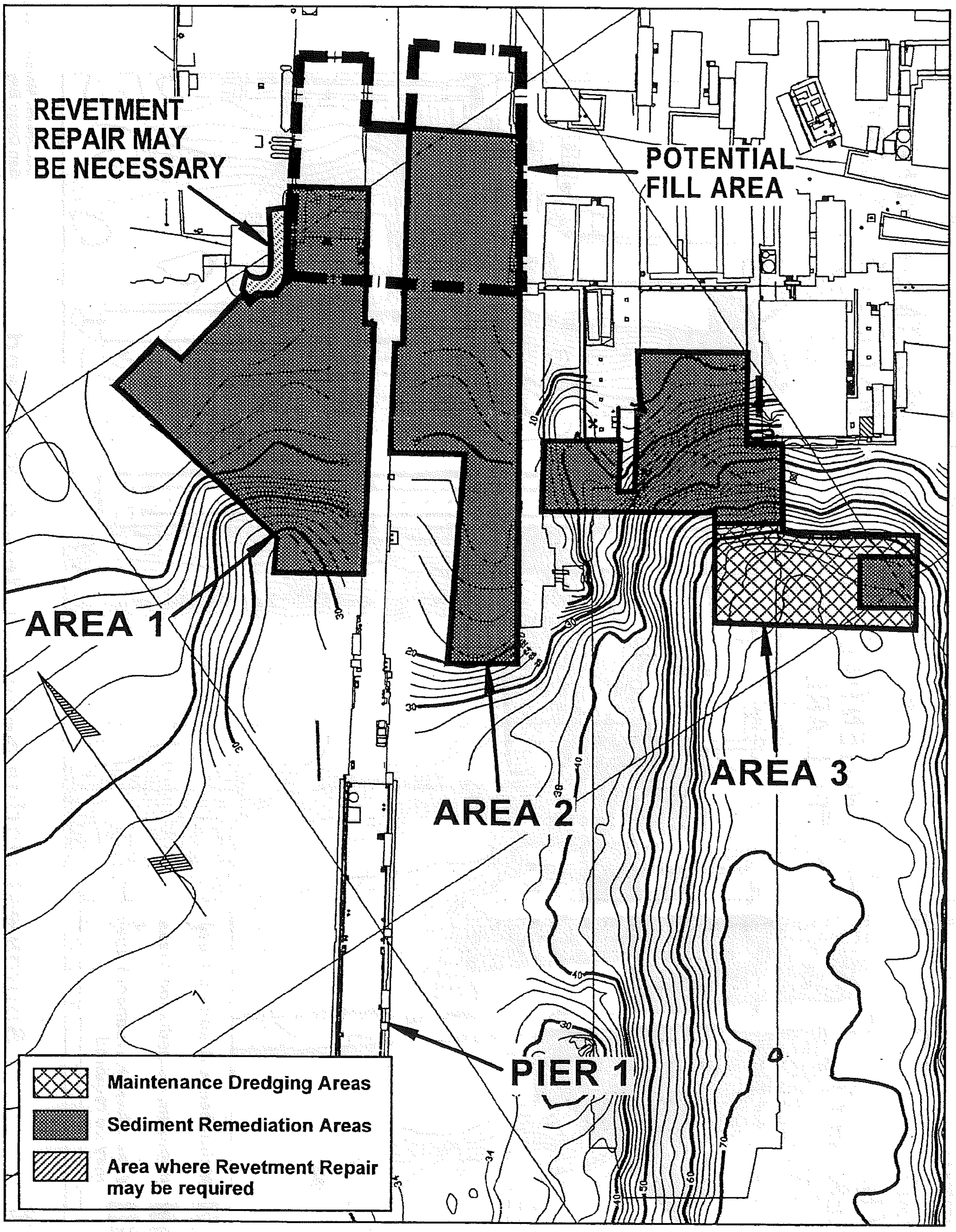


FIGURE 4

Southwest Marine Western Remediation Areas

Southwest Marine Dredging
San Diego Bay
City of San Diego
County of San Diego, CA
June 2000

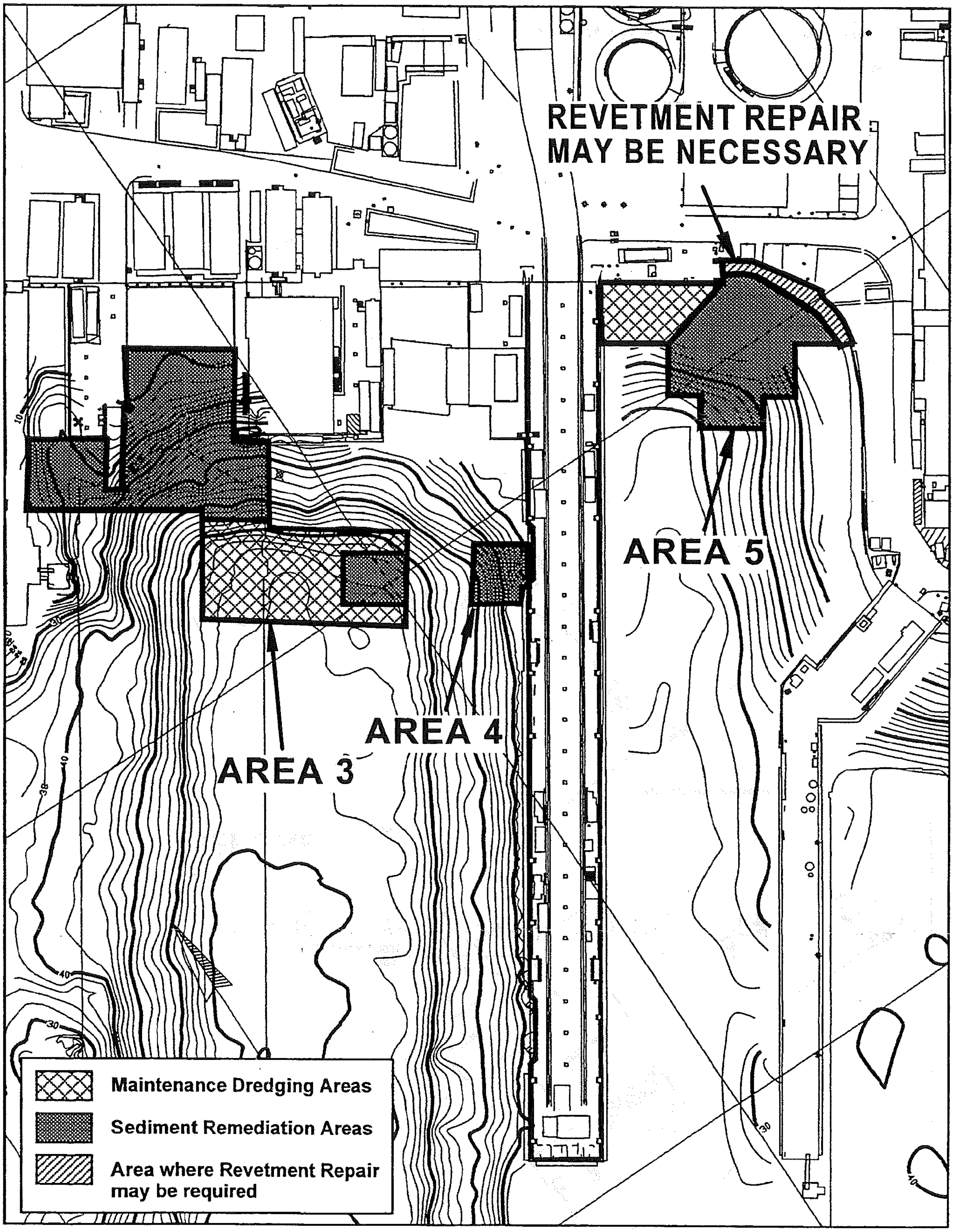


FIGURE
5

Southwest Marine
Eastern Remediation Areas

Southwest Marine Dredging
San Diego Bay
City of San Diego
County of San Diego, CA
June 2000

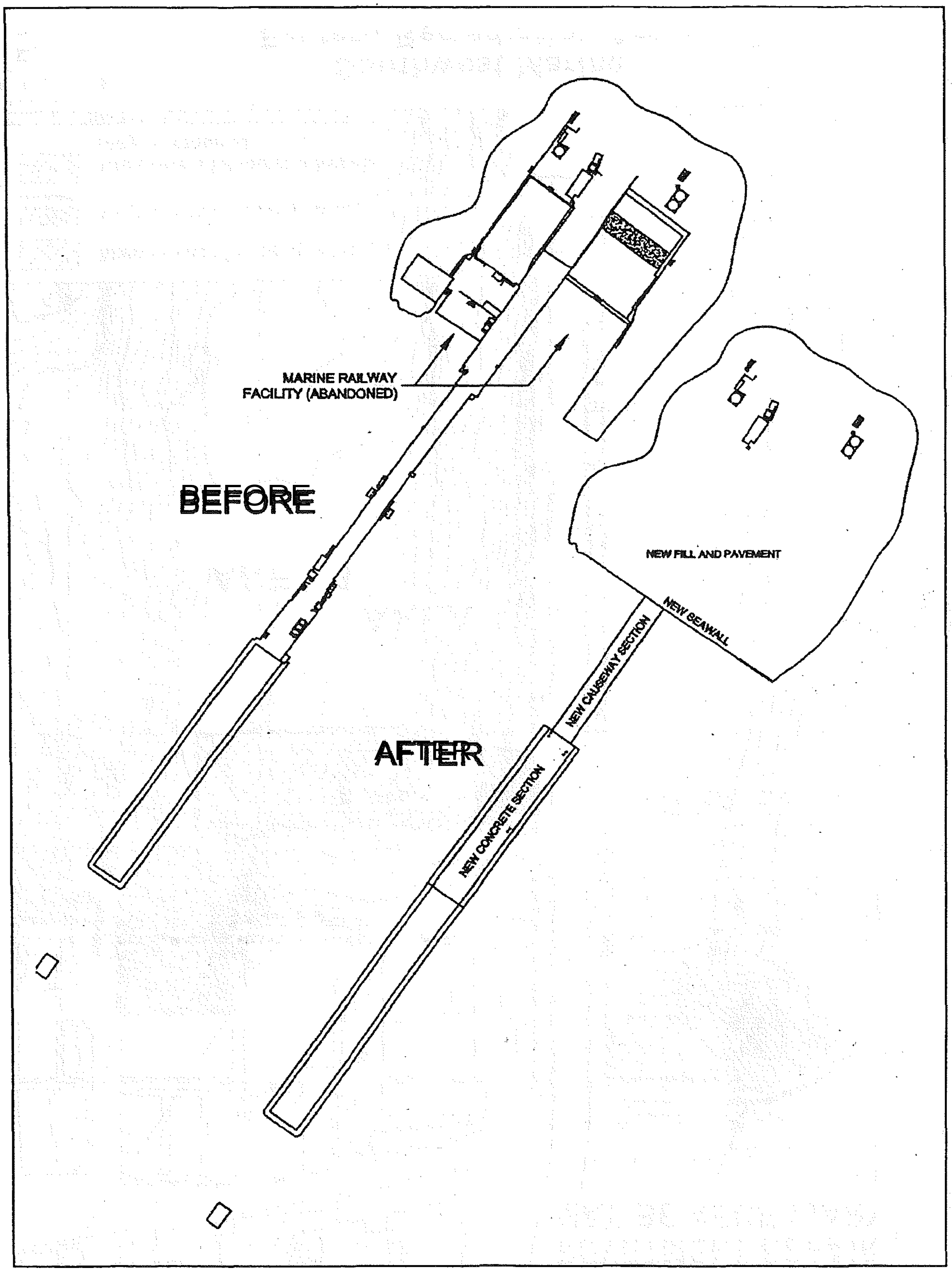


FIGURE 6

Quaywall Improvements
Pier 1 Improvement Plan

Southwest Marine Dredging
San Diego Bay
City of San Diego
County of San Diego, CA
June 2000

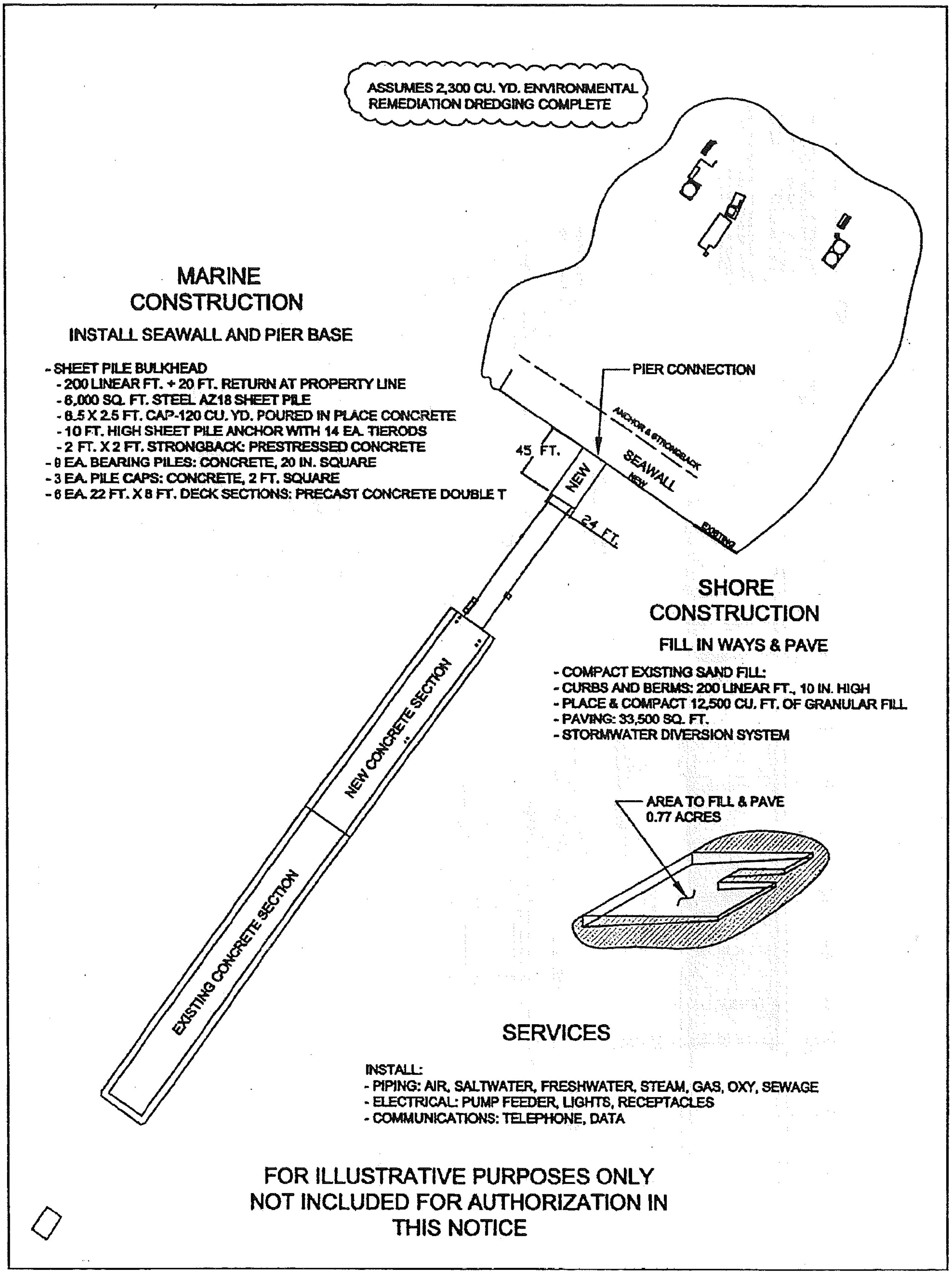
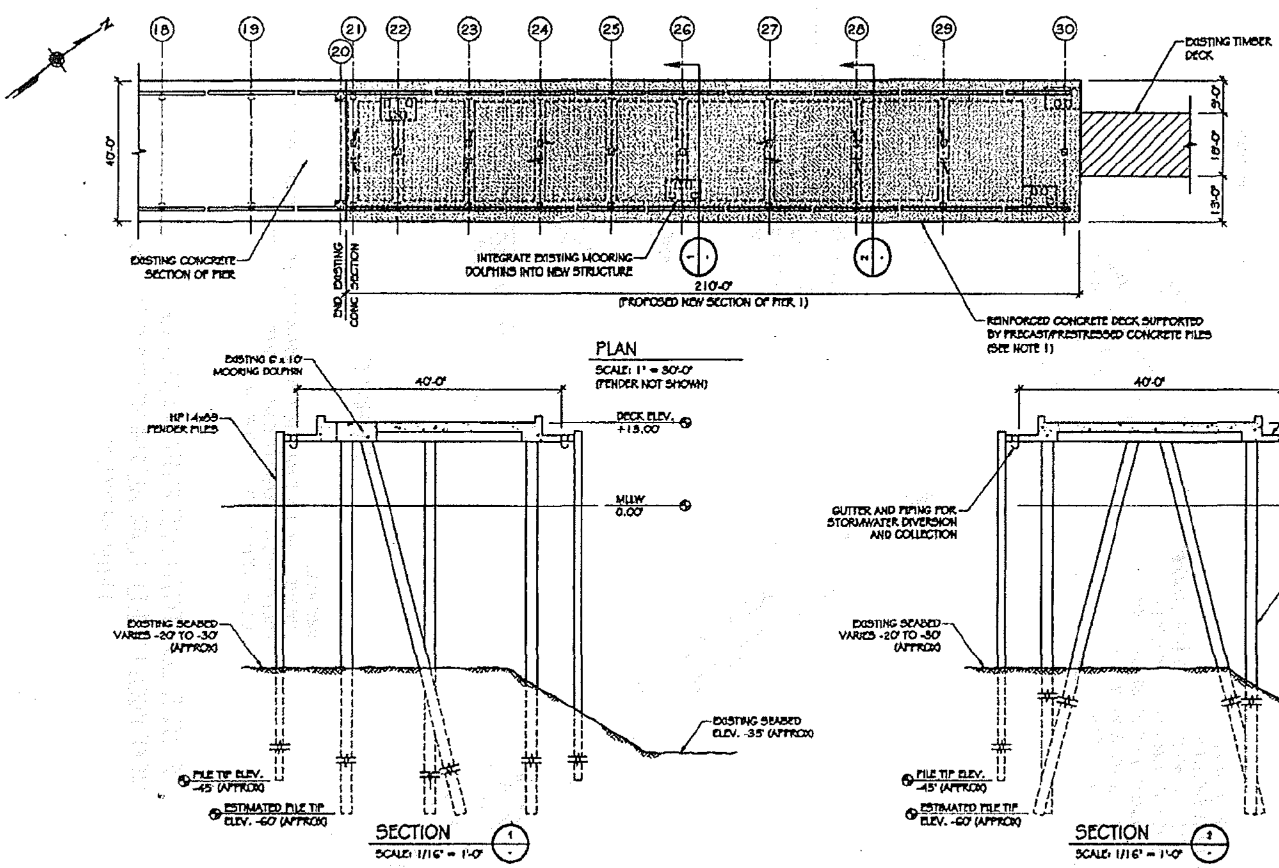


FIGURE 7

Quaywall Improvements
Marine Construction

Southwest Marine Dredging
San Diego Bay
City of San Diego
County of San Diego, CA
June 2000



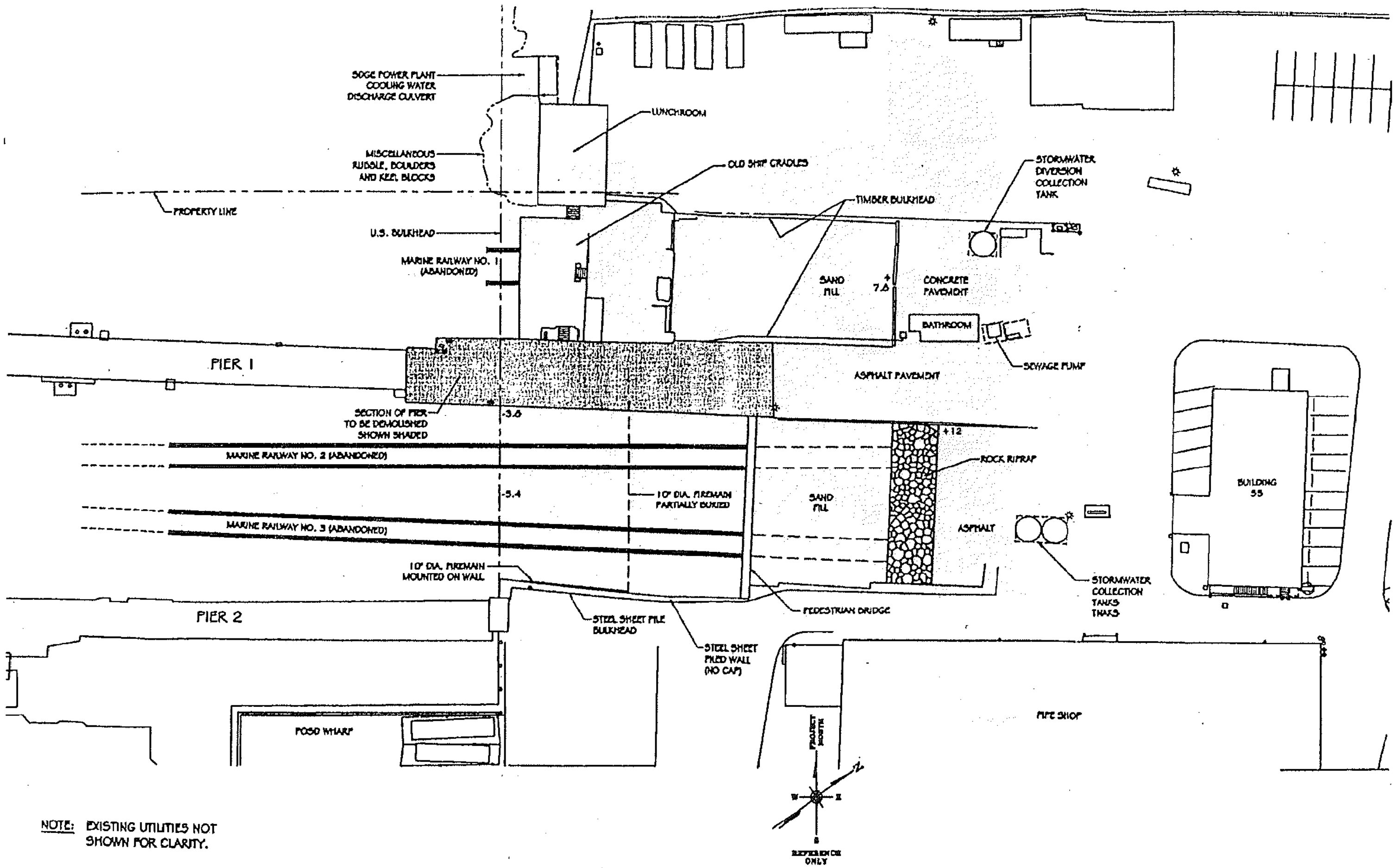
NOTES:

1. THE GENERAL CONFIGURATION OF THE PROPOSED NEW SECTION OF THE PIER IS DESCRIBED AS FOLLOWS:
   - 8400 SQ FT TOTAL DECK AREA CONSTRUCTED FROM PRECAST CONCRETE PLANKS AND CAST-IN-PLACE OVERLAY (TOTAL DECK THICKNESS WILL VARY BETWEEN 1'-6" AND 1'-8").
   - APPROX. 340 LINEAR FEET OF CAST-IN-PLACE REINFORCED CONCRETE PILE CAPS OF NOMINAL 3 FT DEPTH.
   - 33, 20 INCH SQUARE PRESTRESSED PRECAST CONCRETE PILES DRIVEN TO AN AVERAGE TIP ELEVATION OF -60.00' (MLLW).

FIGURE 8

Quaywall Improvements Framing Plan

Southwest Marine Dredging
San Diego Bay
City of San Diego
County of San Diego, CA
June 200?



SCALE: 1" = 80'-0"

FIGURE 9

Quaywall Improvements
Preliminary Engineering - Existing Conditions

Southwest Marine Dredging
San Diego Bay
City of San Diego
County of San Diego, CA
June 2000

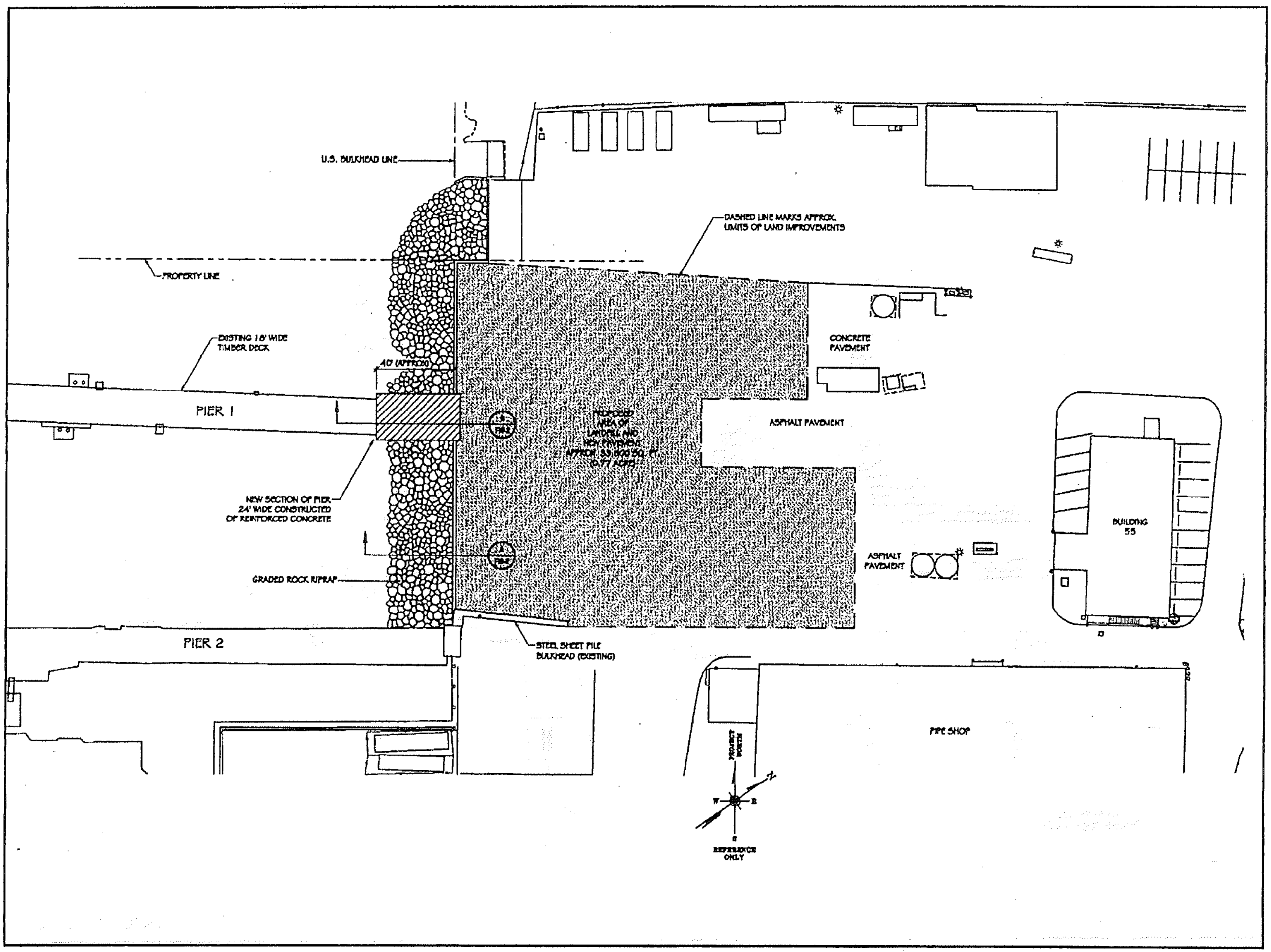


FIGURE 10

Quaywall Improvements
Alternative B - Riprap Revetment Stabilized Bulkhead - Site Plan

Southwest Marine Dredging
San Diego Bay
City of San Diego
County of San Diego, CA
June 2000

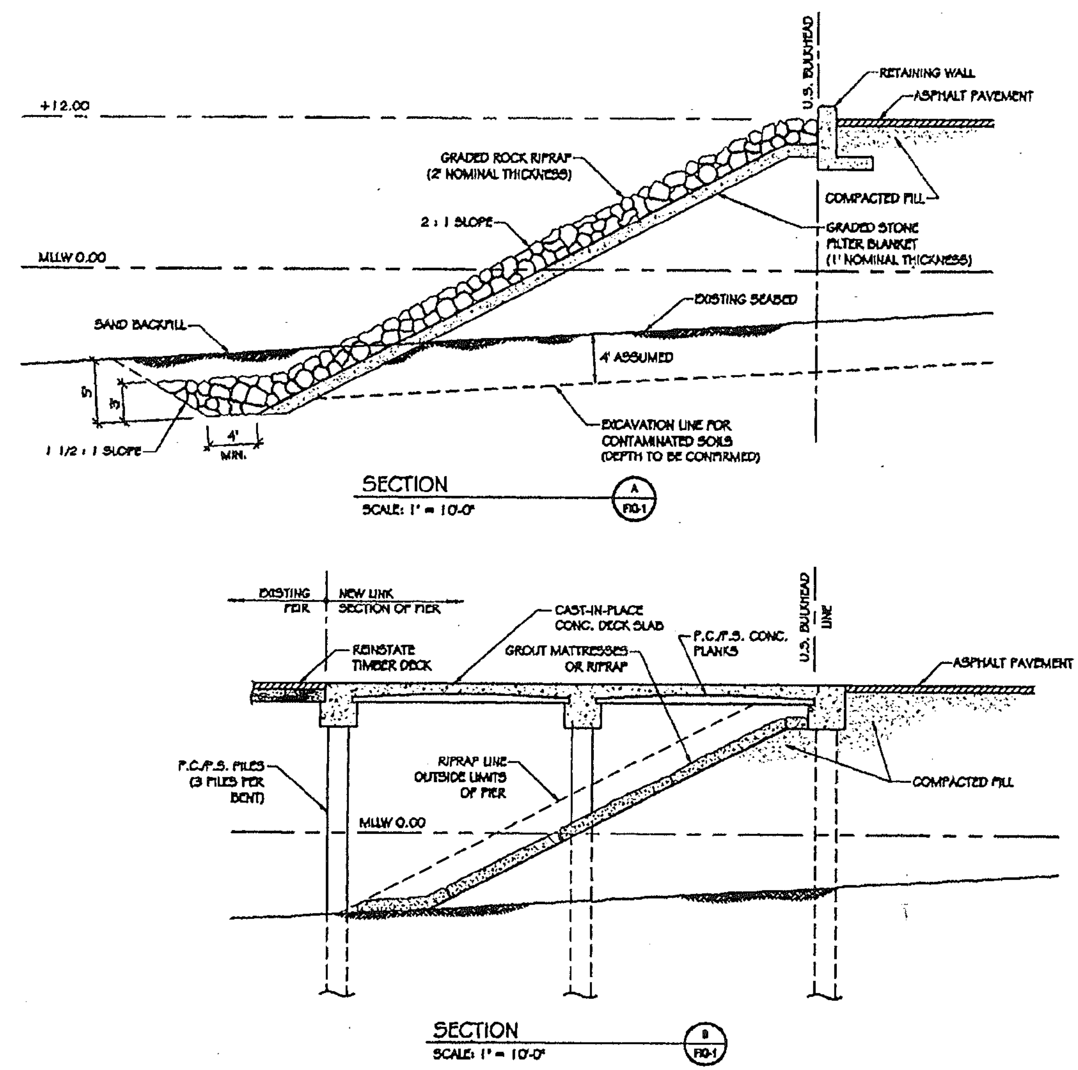


FIGURE 11

Quaywall Improvements
Alternative B - Riprap Revetment Stabilized Bulkhead - Section Plan

Southwest Marine Dredging
San Diego Bay
City of San Diego
County of San Diego, CA
June 2000

Javia

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CORPS OF ENGINEERS
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STATE OF CALIFORNIA

REGIONAL WATER QUALITY CONTROL

BOARD SAN DIEGO REGION

Metropolitan Wastewater
Department Auditorium
9192 Topaz Way
San Diego, California
Wednesday, October 11, 2000

PUBLIC HEARING

ITEM 9

(Reporter's Transcript of Proceedings)

ITEM 9: San Diego Bay Sediment Cleanup Levels:
a. National Steel & Ship Building Company (NASSCO) (Tentative Resolution No. 2000-122)
b. Southwest Marine (Tentative Resolution No. 2000-123)

[redacted]

STATE OF CALIFORNIA

REGIONAL WATER QUALITY CONTROL BOARD

SAN DIEGO REGION

9771 Clairemont Mesa Boulevard, Suite A
San Diego, California 92124-1331
Information: (858) 467-2952
CALNETs: (8) 734-2952

APPEARANCES

BOARD MEMBERS:
WAYNE BAGLIN, Chairman - Municipal Government
THOMAS B. DAY, Vice Chairman - Undesignated Public
FRANK PIERSALL - Industrial Water Users
LAURIE BLACK - Water Quality
JOHN MINAN - Water Quality
JANET KELLER - Recreation/Wildlife

EXECUTIVE STAFF:
JOHN H. ROBERTUS, Executive Officer
ARTHUR COE, Assistant Executive Officer
MICHAEL McCANN, Senior Engineer and Ombudsman

STATE BOARD STAFF COUNSEL:
JOHN RICHARDS

INDEX

SAN DIEGO, CALIFORNIA; WEDNESDAY, OCTOBER 11, 2000

ITEM 9

CHAIRMAN BAGLIN: We will then proceed with Item 9, San Diego Bay Sediment Cleanup Levels. Mr. Robertus?

MR. ROBERTUS: Mr. Chair, this item was last before the Board for decision on the 10th of March of 1999 when the Board issued interim cleanup levels for the sediments in two shipyards located in San Diego Bay, for NASSCO and Southwest Marine.

At that time, the Board instructed me to proceed with efforts to find anything new that might be germane to the cleanup levels and to bring it back at such time as that information could be put together, and we provided a briefing on our activities at our board meeting last month.

Today Vicente Rodriguez is going to review the materials that have been sent to you for this meeting today, and potentially there is an opportunity for the Board to adopt resolutions to establish cleanup levels that may be different from what were previously provided in the interim cleanup levels for the two shipyards. So at this time, I'd like to turn the program over to Vicente Rodriguez for his briefing.

Page 5

VICENTE RODRIGUEZ,

MR. RODRIGUEZ: First of all, I'd like to let you know that Alan is handing you my slides. Good morning, my name is Vicente Rodriguez. I'm a water resource control engineer with the Regional Board staff.

This morning I will be presenting Item 9, the Board's consideration of adopting resolution Nos. 2000-122 and 2000-123 which establishes sediment cleanup levels for National Steel & Ship Building Company and Southwest Marine shipyards. Tom Alo and Alan Monji are also here today to assist me in the presentation.

Today I will cover these five topics: why are we here today, additional clarification of the cleanup levels, Regional Board legal obligations and authority, options available to the Regional Board, and various outcomes from selection of the available options.

It looks like we're having technical problems with the computer. I'll just go ahead and continue off the slides that we handed to you.

Why are we here today? We're here because of two reasons: one, there are elevated concentrations of chemicals at the shipyards, and the second reason is a follow-up to a previous board meeting to bring this back to the Board.

The slide that's up right now shows the two

Page 6

shipyards located within San Diego Bay. They are located approximately between Campbell Shipyard and the Navy facility by the Coronado Bay Bridge.

The two pull-out boxes show Southwest Marine's site and NASSCO's site. The area in green shows the aerial extent of contamination above ERM levels, and I will explain in more detail what an ERM is and why we use that as an indicator.

As I mentioned earlier, on March 10th 1999 the Regional Board adopted two resolutions: Resolution 99-12 and Resolution 99-20. Both of these resolutions established interim cleanup numbers for the two shipyards.

Also, at the March '99 board meeting, the Regional Board directed the executive officer to establish a peer review on using the interim cleanup numbers at the two other shipyards and to follow it up with the workshop. The Regional Board also directed the executive officer to bring this item back to the Board with its discoveries, with its findings.

This next set of slides will discuss the various cleanup level options, and basically these cleanup level options presented in the staff report are derived from these three approaches: background, effects range median and AETs.

On this slide you can see that there are

Page 7

three reference stations. And in trying to find out what are background numbers, what numbers would be at the shipyards if the shipyards were not there, what we did is we took a look at these three reference stations that are defined in the shipyards' and boatyards' NPDES permit to see what the condition of the sediments are at other locations.

What we did is we tried to find a reference station that would be most similar to the watershed or the contribution of the storm drains at those sites, and we looked at storm water data at the two shipyards, and we did 10 comparisons or 10 chemical concentrations for each shipyard, and we compared those chemical concentrations to each of the reference stations. And then we looked at the ones that were the most similar, and reference station No. 3 had 70 percent compared to the other two references.

And the way we determined that that was the most similar is by doing a statistical analysis to see if there was a statistical difference or a significant difference, I should say, between the two comparisons.

CHAIRMAN BAGLIN: What's "S" and "N"?

MR. RODRIGUEZ: Oh, the "S" means that there was not -- how many comparisons were not significantly different for Southwest Marine, and the "N" is for NASSCO.

So the formulas there shows that for example

Page 8

reference station No. 1, Southwest Marine had 5 comparisons out of 10 that were not significantly different, and NASSCO had 6 comparisons that were not significantly different. That process was done for each of the three reference stations, and that's how the 70 percent was generated.

DR. DAY: So roughly speaking, the combination of Southwest and NASSCO is 55 percent of the reference station; is that what that's supposed to mean?

MR. RODRIGUEZ: Could you ask your question again?

DR. DAY: I'm trying to understand what the 55 percent --

MR. RODRIGUEZ: 100 percent would mean they're very similar. Zero percent would mean they are very different.

DR. DAY: Thank you.

MR. RODRIGUEZ: So the background numbers listed in the staff report are derived from reference station No. 3 because it's the most similar.

The other cleanup level discussed in the staff report are ERMs, and ERMs are a screening tool. ERMs, it's a national data base that was developed to help give perspective on chemical concentrations when you have no biological data. So when you have that information, you can look at the ERM and it can give you a perspective on whether -- if the concentration is at a level of concern.

This slide shows how an ERM is developed. There are green and red dots plotted on this chart, and each dot represents a study done somewhere in the U.S., and the dot's concentration represents at what level was there an adverse effect in that study.

If you rank the level of concentrations from low to high, and you pick the middle number, that defines the ERM. So 50 percent below the ERM are -- there are significant effects, 50 percent below and 50 percent above, and the way it's shown on this graph is the number of red dots in the green box is equal to the number of red dots in the red box. Like I said, this is an example of how an ERM is developed.

CHAIRMAN BAGLIN: Vicente, on the ERMs, in the information that was provided to us there was some suggestion that this was a scientific analysis, but this system was not necessarily meant to establish cleanup levels.

MR. RODRIGUEZ: That's correct. The ERM is used as a screening tool to help give you perspective on a concentration number when there is no biological data.

One of the reasons why we included it in the staff report is to give you that perspective, and also there is no biological data at the shipyards right now.

This next cleanup level I'll be going into

some detail because you'll be hearing a lot about AETs, and so I'll try to explain what an AET is. I'm also going to try and explain the lowest AET, which you may hear come up with other people speaking, toxicity tests used in deriving that AET, and why even use an AET, why are we proposing the AET that is before you.

This next slide comes out of Campbell's work plan. I have it up here to kind of walk you through how Campbell's AET was developed. The yellow bar up there represents the concentration of range of the 14 stations that were -- the 14 samples at the stations taken at Campbell.

The green dots represent the concentrations at which there was no toxicity observed. The red dots represent where there was toxicity observed. And this next slide will break those sample points out. So, again, the green dots represent where there was no toxicity observed, and the red dots represent where there was toxicity observed.

DR. DAY: Toxicity is defined how?

MR. RODRIGUEZ: Toxicity is defined -- there's different tests that are run to determine what toxicity is. I can go into detail now, or we can wait a few more slides.

DR. DAY: Does it kill animals, or is it just a concentration?

MR. RODRIGUEZ: It kills animals.

The apparent effects threshold is defined by looking at the highest of -- by looking at the highest no observed adverse effect. That's what this green dot here represents. It's the highest of all these other green dots, and that's the point at which an AET is defined.

Above that it's unknown whether there's adverse effects. So that's the apparent effects threshold that's defined as the AET. So if you look at the bar at the bottom where there is the toxicity observed, the two on the left were probably due to something else besides copper. The two on the right were probably due to copper.

The reason that's so is because at these copper concentrations, there was no toxicity observed. That's the process behind an AET. You'll also hear about lowest AET, and this is really how the Campbell's cleanup numbers were developed.

This next graph shows a graphical example. These are not directly from Campbell's numbers. They were just put up there as an example. There are several different tests that are run to generate an AET for each one of those tests. So you'll have tests A, B, C and D, and each one of those will generate a different AET because each test has a different sensitivity.

Then to address the lowest sensitivity, the

lowest AET is selected, and that is the cleanup level that was used at Campbell by selecting the lowest AET of multiple toxicity tests.

And to kind of address some of the questions that Dr. Day just brought up, there's different types of tests for toxicity. There's no probe or meter that you stick in the water or sediment to see if it's toxic or not. You expose sediments to organisms, and then following certain protocols on the number that die or stop growing, you can say there's toxicity or there isn't toxicity.

And these are examples of different types of tests and protocol: polychaete, amphipod, bivalve, echinoderms, microtox, benthic infauna abundance, and these marine organisms that are, like I mentioned, exposed to the sediments, and then that's how toxicity is determined. After you run one of these tests, it's either a green dot or it's a red dot.

DR. DAY: And you get the number from the feds or something like that?

MR. RODRIGUEZ: These particular tests were recommended by the Puget Sound Estuary Program in the State of Washington.

Toxicity tests that are considered in the staff report are pulled from the previous slide: polychaete, amphipod, bivalves and benthic infauna abundance.

So the next question is why use an AET, and to kind of help address this question, I'm going to go ahead and skip on to the next slide before answering it which talks about the Regional Board's legal authority on sediment cleanup levels.

Here's a concept diagram of State Board Resolution No. 92-49. There's a lot of information here, so we'll just focus on two defining lines: the blue background line on the right-hand side and the red beneficial uses line on the left side.

In short, 92-49 says that cleanup levels can not be more stringent than background and cannot cause or threaten to cause a condition of pollution. Pollution is defined as a condition at which beneficial uses are impaired.

We've already defined the blue line earlier when we were talking about reference station No. 3. We're using reference station No. 3 to say this is where the level of concentration for background is at. However, we have not done that for the red line.

There are basically two beneficial uses that will define that red beneficial uses line: one, the marine habitat and, two, human consumption of fish, shellfish or other organisms. First let's focus on human consumption of

fish. The concern here is that contaminants in the sediments will bioaccumulate and biomagnify at higher and higher levels in the organisms that will be harmful to humans.

Based on the information gathered at Campbell Shipyard when their cleanup level was established and the California Toxics Rule, we assume that bioaccumulation will not occur at the shipyards at levels higher than background. However, staff is recommending that bioaccumulation studies be done at the shipyards to confirm this assumption.

The second beneficial use that I mentioned earlier has to do with concern about the protection of marine habitat. Again, based on studies done at Campbell Shipyard, staff believes that this will be the driving force, this will be the beneficial use that will be the driving force for setting up a cleanup level.

So the question is at what concentration is the beneficial use -- at what concentration is the beneficial use for marine habitat impacted? And the answer is we don't know, which leads us back to the previous question as to why AETs.

AETs are a tool to help us find out at what concentration levels impact the marine habitat which, in turn, defines the beneficial use line and that's why AETs

are brought into this picture.

These next slides will look at the options the Regional Board has on staff's recommendations. There are basically two actions the Board can take. One action, the Regional Board can select cleanup levels at the next board meeting. Or since there is no biological data at the shipyards, the Regional Board can direct the shipyards to go back and do a full comprehensive study and select a cleanup level after that study is complete.

If we focus in on each of these individual actions, there are several options available to the Board. The Board can set up cleanup levels somewhere near background which would be the blue background line, or they can set it at the beneficial uses line which I introduced to you as being the AET.

If the Regional Board picks background or somewhere near background, staff recommends that no additional studies would be necessary since there would be an extreme level -- the whole amount of contaminants would be removed and staff would not believe there would be any contaminants left to impact beneficial uses.

However, if the Regional Board picks at the red line at the beneficial uses, and uses the Campbell AETs as the guiding number to set the cleanup levels because there are no biological tests at the site, staff recommends

that there be a pre-sampling program. And then based on the results of the pre-sampling program, the shipyards would dredge.

And, basically, action No. 2 would be a full comprehensive study where the shipyards would not base their dredging on Campbell's AETs, instead they would develop their own AETs independent of Campbell's data.

These next graphs are intended to help you make a decision. They look at the options in a cost curve, in cost versus volume of sediments to be dredged. Now that we've already defined that the cleanup is somewhere between the background line and beneficial uses line, you can see the four options in between this range and the fifth option of no action being outside that range.

At this time, it might also be useful when you're looking at this graph to look at tables 1 and 2 that were included in the staff report. This information, this graph is derived from the tables where you have the volume of sediments to be dredged at the bottom and cost, and you can see where dredging to cleanup levels set at the Campbell or nearest Campbell is somewhere in the $2 million mark for NASSCO. And if it's set at ERMs, it's somewhere around the $8 million mark, and background would be somewhere above the $12 million mark.

DR. DAY: What's the red vertical line?

Page 17

MR. RODRIGUEZ: The red vertical line is the beneficial uses line. In other words, that's the AET line. In this particular instance, it's the Campbell's AET. If you see, this red dot right here represents Campbell's AETS.
MR. MINAN: Excuse me, I have a question. How did you determine the economic cost of obtaining background levels?
MR. RODRIGUEZ: All this data was provided to us by the shipyards. We told them if the Board selected a cleanup level at, let's say, background, how much volume would you be dredging and how much would that cost you.
We asked them that information for all the levels at both NASSCO and Southwest Marine, and they provided us that information, and then we summarized it in the tables for you.
CHAIRMAN BAGLIN: Vicente, a follow-up question to that, did they provide detailed information or just the ultimate numbers?
MR. RODRIGUEZ: Just the ultimate numbers.
This slide is for Southwest Marine; the previous one was for NASSCO. And just due to the size of the facility, NASSCO's background was somewhere over here. So they would be dredging more than Southwest Marine. Southwest Marine is over here because they're a smaller

Page 18

facility.
DR. DAY: Remind me, the AET is without any biological testing, and the ERM is with biological testing?
MR. RODRIGUEZ: No. AETs -- maybe I should back up a little bit. AETs are developed by doing biological testing; however, at the shipyards, Southwest Marine and NASSCO, there has been no biological testing, and instead are relying on biological testing done at a nearby shipyard which would be Campbell.
DR. DAY: But using the chemical composition of those?
MR. RODRIGUEZ: Yes. They have no biological testing, but they have gone out there and taken chemistry sampling. Because there is no biological testing, that's why in the staff report staff recommends that it not be as comprehensive as if they were developing their own AETs, but doing some type of pre-sampling to show that at low levels it's not toxic.
DR. DAY: And ERMs are...
MR. RODRIGUEZ: The ERMs, there is no biological testing. That's why ERMs are used as a tool. ERMs, when you have a chemistry concentration number, but you don't have biological information. You don't know if it's toxic or not. So you need some type of perspective about what does that concentration number mean.

Page 19

This is where ERMs come in. You get an ERM and you look at it, and you compare it to the concentration that you have, and it tells you is it on the high end or is it on the low end compared to the ERM.
Now, once you have biological testing, ERMs aren't -- I don't want to say as important, but they don't carry the same weight because ERM is derived from data at other places in the U.S.
This last slide talks about the practicality of the decisions you'll make, what are the outcomes. If the Regional Board in November selects a cleanup level at background or near background like ERMs, then no additional studies will be necessary and the shipyards can begin immediate dredging.
If the Board selects numbers at the beneficial uses line using the Campbell AET numbers or somewhere near the Campbell AET numbers like 20 percent, then staff recommends that the shipyards do pre-sampling, biological sampling where there will be a limited amount of testing that would not be required for the full comprehensive analysis.
Then the results of that pre-sampling will determine whether -- if the results come back that it is not toxic, then they can begin testing, I mean, begin dredging. If they come back that they are toxic, then

Page 20

additional sampling will be necessary.
And then the third option I have listed is requiring the shipyards to do a full comprehensive analysis to develop their own site-specific AET independent of Campbell's data. Then once the result of that study is complete, we would bring it back before you for you to make a decision on cleanup numbers.
This concludes my presentation. Are there any questions?
CHAIRMAN BAGLIN: I'll ask a question. Vicente, I'm not sure whether it's you or Mr. Richards that might help me out on this. We have just gone through a science class a little bit on this, and we had a brief mention of economics in it. And in some of the information that's been provided to us, it's referring to Water Code Section 13304, as it's stated in one letter that we get, that mandates that when waters are discharged to the state that are pollutants, they have to be cleaned up by the discharger.
And then there is a suggestion that State Board Resolution 92-49 actually requires dischargers to clean up to background levels for the highest water quality which is reasonable. In another letter we had said that it stated that 92-49 states that to insure that the discharger shall have the opportunity to select cost-effective

Page 21

methods.

Is there a clear standard that we're supposed to be listening to? Like, for instance, on 13304, what is the mandate? And on State Board Resolution 92-49, what is the clarification as to what we really should be implementing?

MR. RODRIGUEZ: I should say, a lot of those are summarized in 92-49. 92-49, the intent is to gather and synthesize all the different parts in Porter-Cologne, and be used as a guideline for setting cleanup levels or cleanup standards. I guess cleanup levels is the correct word.

92-49 does say that cleanup levels will be set at background or as close to background as possible based upon -- and I think I put it in your documents quite a few times, and there's a laundry list of things that you need to consider when setting cleanup as levels close to background as possible.

The part about not telling the discharger how to clean up is true, and John Richards can interrupt me if I speak incorrectly. We can tell the shipyards or any discharger that they need to clean up to a certain level, but we can't necessarily tell them that they have to do it using this method or that method.

CHAIRMAN BAGLIN: So I guess I'm still looking for,

Page 22

92-49 says to clean up to background levels or as high as possible. What's the caveat that is linked in there regarding economics?

MR. RICHARDS: Reasonableness.

MR. MINAN: I can read this section to you. It says, "For the best water quality which is reasonable, if background levels of water quality cannot be restored considering all demands being made, and to be made on those waters and the total values involved, beneficial and detrimental, economic and social, tangible and intangible."

MR. PIERSALL: Very clear.

CHAIRMAN BAGLIN: It helps.

MR. RICHARDS: And that helpful guidance comes out of one of the early sections of the Porter-Cologne Act that sort of sets the general state policy in favor of having clean water.

The statute under which you exercise your cleanup and abatement authority gives you the authority to require cleanup of wastes and the abatement of the consequences of discharges of waste which would include pollution and nuisance.

To achieve that, you have got to require cleanup at least to the level that would equal the water quality objectives. So if you had a pollutant that was in the water column, such as acid or a dissolved pollutant of

Page 23

some kind, you would have to at least require that that pollutant was reduced to the water quality objectives which are defined as the levels necessary to sustain the designated beneficial uses.

Here the problem is a little more indirect because you're dealing with a situation where the pollutants are not so much in the water column as in the sediments, and it's their presence in the sediments that affects the water quality in the area and affects the beneficial uses to include the benthic communities and so forth and so on.

If that level of nonpollution is not background, you still have discretion to require that cleanup go beyond the nonpollution level up to and including background. In other words, remove -- you're directed to get the water to be clean. It has to go back to the point at which it's not polluted.

Beyond that, you have the discretion to demand as much cleanup as is reasonable, and that is an interpretation that the state board made in Resolution 92-49. If the discharger cannot achieve a cleanup to the nonpolluted level, then the pollution persists.

CHAIRMAN BAGLIN: What's the comparison and meaning of reasonable and maximum extent practicable, since that's

Page 24

a term that we also face very often?

MR. RICHARDS: It's the terms that allow you to exercise a certain amount of subjective judgment. In determining what is reasonable, you would look at all of the factors that Mr. Minan mentioned, economic considerations, the cost of cleanup, the incremental level of either water quality or sediment condition, improvement per dollar spent on achieving it. You would look at the significance of the beneficial use, all these considerations.

And the maximum extent practicable is essentially the same kind of analysis that you would have to do. It requires you to again balance all of these considerations and achieve the greatest amount of cleanup and the greatest restoration of background conditions that is practicable. And that depends on the available technology, and it depends on the extent of the pollution and so forth.

CHAIRMAN BAGLIN: There seems to be some presence of evidence that the sediment in the areas that we're talking about is not satisfactory for beneficial use, that it is toxic. That perhaps is rather tangible.

As we're making any determination on the other factors included, such as economic, if we are to be persuaded that there is an economic argument, can we also

Page 25

ask to have the specificity with that that we do, for instance, for the biological? And that is just not someone stating that this is not reasonable, this is not practicable, but here is the evidence that shows income, outflow, expenses, profit...

MR. RICHARDS: Absolutely. You can delve into that to the maximum extent possible. In fact, you should before you make a determination that something is infeasible or not practicable. You should certainly look at more than a bald assertion that this is going to cost a lot.

CHAIRMAN BAGLIN: Any more questions?

MR. PIERSALL: John, if it turns out that it is practicable to clean up to, say, background levels and that there's no evidence that the shipyards in question, whichever one it would be, can't afford to clean it up, does that kind of preclude us from doing anything except background levels?

MR. RICHARDS: Let me understand your question correctly. You're saying that it would be determined that the Board would find that it is practicable to achieve background cleanup, and that there is no evidence that it would be impracticable for the shipyards to achieve that?

MR. PIERSALL: That it would be cost prohibitive, yeah.

MR. RICHARDS: Then according to the terms of

Page 26

92-49, you would be obligated to require cleanup to background.

MR. MINAN: Let me ask, I think, a follow-up to Frank's question, or it may be Frank's question again in a slightly different guise. And that is if we were to establish background levels for NASSCO, say, what precedential value would that determination have on all of the other shipyards in the bay? Would we be required similarly to treat any other shipyard in the bay according to the standard of background levels?

MR. RICHARDS: Yeah, it would certainly establish a precedent that for that cleanup, background cleanup was practicable, yes. It would establish a precedent that that was an appropriate level of cleanup.

MR. PIERSALL: Then each case you would also have to look at it and say, is it economically feasible or...

MR. RICHARDS: That's true. Practicability might be affected by site-specific conditions.

MR. PIERSALL: It wouldn't necessarily, say, set a precedent to say, okay, we set the background level for these because we know they can afford to do it, so everybody in the bay has to live by that. As opposed to saying, okay, background level is the desired result, but this guy for other reasons, whatever, can't afford it, it's not economically feasible, and then if he can do it,

Page 27

he can clean up to this level. Is that...

MR. RICHARDS: That would be correct, yes, provided that you achieve a cleanup that goes at least to the point where the pollution has been abated, wherever you set that level, where the beneficial uses are not being -- the quality of the water is necessary to sustain the beneficial uses not being impaired.

MR. PIERSALL: Beneficial use nonimpairment would be below the highest level.

MR. RICHARDS: That's right. That would be the threshold of pollution, if you will.

MS. BLACK: If you take a look, as you go through the history -- and Campbell was decided back in '95 -- to the cleanup and abatement order to basically Option 4, they're all kind of clustered together. What would be the incontinuity of deciding one level for shipyards, but then four and a half years ago it was decided another level within the bay? Do you see what I'm saying? Campbell is one level, but potentially you have...

MR. RODRIGUEZ: I think that's where your discretion comes in because you do have that range to pick from.

DR. DAY: Following up on that, have we set levels for the Campbell shipyard?

MR. RODRIGUEZ: Yes.

Page 28

MS. BLACK: Yes, it's in Option 4.

DR. DAY: Campbell is where they're going to build a hotel that's going to support the ballpark; is that the one? That's the shipyard?

MR. RODRIGUEZ: The one next to the convention center.

DR. DAY: And did we do that on the basis of biological tests or just on the chemistry?

MR. RODRIGUEZ: No, it was quite a bit of biological testing, that third option I showed on the last slide where they did a full and comprehensive analysis. And then based on that, we brought it before the Board, maybe some of you, I don't think all of you, and the Board decided to set the cleanup level at that AET.

DR. DAY: So assuming Ms. Black's point, at least logically, in order to avoid full employment for lawyers, it would be sensible to start out at least at the same Campbell level. And then if we find evidence to change it up, we might change Campbell as well. But at least they're all linked together, if that makes some sense.

MR. RODRIGUEZ: It did make sense.

DR. DAY: It depends on who your lawyer is.

MR. PIERSALL: I don't think that the level we set for Campbell sets a hard precedence, if I'm correct. Is that right, John?

MR. RICHARDS: That's correct. It was based on a site-specific establishment of the AET levels, but the Board retains the continuing jurisdiction to reassess the adequacy of those levels and the adequacy of the level of cleanup under the principles of 92-49.

MR. PIERSALL: Just a question here, if we decided that we made a mistake on Campbell cleanup, can we go back and revisit that and say you got to clean it up to background levels or to another level?

MR. RICHARDS: Yes.

MR. PIERSALL: That's not on the Board right now. That's just a question. I'm trying to find out our parameters.

CHAIRMAN BAGLIN: Any more questions right now?

MR. RODRIGUEZ: I would just like to add another clarifying point. When the Campbell numbers were developed and selected as the cleanup level, it was made clear in the cleanup and abatement order and to the Board that the cleanup numbers derived at Campbell was designed for Campbell, and --

MR. PIERSALL: Site specific.

MR. RODRIGUEZ: Yes. And the intention was not to set a precedent for using those numbers at other shipyards. What's happening now is there is no biological data at these other shipyards, and instead of looking at a blank

wall, we're looking at Campbell shipyards to get an idea at these other shipyards.

DR. DAY: I realize Campbell is not before us, but since we set levels for Campbell back then, have we done continued testing or monitoring at Campbell?

MR. RODRIGUEZ: There has been monitoring under their NPDES program, but not for biological. There has been no biological testing.

DR. DAY: And they've been cleaning up.

MR. RODRIGUEZ: No. They are currently in violation of their cleanup and abatement order, and the executive officer issued a notice of violation, I believe it was in August.

DR. DAY: I see. I'm only trying to remember, they're not cleaning up because they're not sure it's final or something like that? Why aren't they cleaning up?

MR. RODRIGUEZ: We have not gotten an official response from Campbell why they have not cleaned up. They are working on their response. It has been complicated a bit because the port is now actively involved in the cleanup at Campbell, and so we're told that the response to the notice of violation is being worked together with the port.

DR. DAY: Maybe we should do some more testing of

biological over there and change their levels.

MR. PIERSALL: That's possible. I think part of the problem is they had enough financing for that hotel that they were supposed to build there, so they're not doing anything. I think that probably has a lot to do with it.

CHAIRMAN BAGLIN: Now we have another subject emerging. Do you have anything else, Vicente?

MR. RODRIGUEZ: No.

CHAIRMAN BAGLIN: I have speaker slips from 12 individuals who would like to comment on this before us. I'm sure, as you all know, we're sent quite a package ahead of time that we've got a lot of information on. It would be very helpful to us if you would be very specific about what you support or do not support. And, also, do not feel inclined that you have to get comfortable at the microphone and spend your entire five minutes there.

What I'd like to do is give the first opportunity to speaking to NASSCO and Southwest Marine, if you'd care to take advantage of that. Mr. Hartnett, NASSCO?

MR. CHEE: Chairman Baglin, Mr. Hartnett does not represent NASSCO. Mr. Chee is speaking on behalf of NASSCO.

CHAIRMAN BAGLIN: Oh, excuse me.

MICHAEL CHEE,

MR. CHEE: Excuse me, I was just trying to clarify where the controller was for the presentation. Good afternoon, my name is Mike Chee. I'm the environmental manager at NASSCO. We're located at Harbor Drive and 28th Street as you've seen on the maps before you today.

We would like to thank you for the opportunity to speak today. Obviously this is a very important issue for all of us. The next slide that you'll see is a recap of staff's slides where they're pointing out the specific options that have been proposed within the packets that you've been presented.

In addition to those options, I'd like to just make a couple of specific comments on those options and a couple of comments on the biological testing that we are proposing and that you have before you.

In addition, the additional biological testing that we're proposing or the toxicity testing, it will be conducted on several transects that are extending out from the remediation area. That is, on lines that extend out from the remediation area, numerous samples will be taken and analyzed, and those will be extending out from the existing remediation area.

What we would then do is propose to evaluate the test results of those and determine if the remediation boundary is statistically different from the reference station within the bay. Because of the additional samples that are being taken, the remediation area can be expanded if required to make sure that we demonstrate protection of beneficial uses and water quality. Additionally, the toxicity tests will provide other benefits as we establish a cleanup standard that's protective of San Diego Bay.

The biological data will support the establishment of cleanup levels that do, in fact, protect the beneficial uses and water quality, rather than choosing an arbitrary chemical value. The testing will also address the peer review comments that were raised concerning the Campbell AETs and the transferring of those AETs to the shipyards. The testing also uses a toxicity standard that has been validated in other areas of the country.

Additionally, the testing is designed to achieve the required level of environmental protection without incurring additional delays or unnecessary costs. Determining the appropriate remediation level through this biological testing is consistent with the prior practices the Board has used in setting cleanup standards.

Campbell AET approach, when you add to this approach the biological testing that we're proposing, you have in our opinion the most timely and the most cost-effective method to achieve this protection of

beneficial uses. The additional testing program is a comprehensive test program, so that if the initial analysis does not confirm the selected cleanup levels will protect beneficial uses, the outer testing area, as I said, will be expanded until we reach a satisfactory result.

Option 3 represents an extrapolation from the AET values that have been determined by the Board. What this option does is it has the benefit of being more timely than Option 5 and more cost effective than Option 1 and 2.

The additional testing that will be conducted on top of the safety factor is really a belts-and-suspenders-type of approach. It adds the safety factor or the cushion that staff has referred to within their report to this approach.

As far as a site-specific AET, no evidence has been presented or is available to indicate that the results from this option would be more reliable as an indicator of protection of beneficial uses and water quality than with Option 4. It represents an unnecessary additional cost to reach the same conclusion that can be supported by the proposed testing. The cost of this study alone could begin to approach the cost of the ultimate remediation.

ERMs, as staff has pointed out, are from a

data base that was developed by NOAA from various sites throughout the United States. They were developed without regard for actual conditions in San Diego Bay, and, more importantly, NOAA advises that ERMs are not intended as cleanup or remediation targets, and also cautions that ERMs are not necessarily predictive of toxicity thresholds.

As far as Option 1, the Board has determined cleanup levels that are required to protect beneficial uses at various times in the past and at various locations, but never at background.

The Board has tailored cleanup to the specific site circumstances. Few examples, Paco terminals, copper was set at 1,000; Shelter Island, 530. Campbell as we've heard is at 810. And at Convair Lagoon, dredging didn't take place. A cap was placed over the contamination site.

We believe that cleanup to background is not legally required, and, more importantly, the key goal is the protection of the beneficial uses and the water quality.

This is a chart that you've seen before from staff obviously. I think it is a very effective chart. It shows that the risk of pollutants remaining decrease as you move more towards the background level. It also shows that the risk of sediment degradation increases as you move more

toward the AET level.

What's not addressed on this chart is toxicity, in other words, the actual biological effects that you would see if there was any pollutant remaining in the sediment.

CHAIRMAN BAGLIN: Mr. Chee, you have gone to six minutes already, and I know you gave us a letter on October 4th that had quite a bit in there. Could you please draw your remarks to a conclusion.

MR. CHEE: This is the last chart, thank you. If you add another arrow onto this chart, starting with the "no action," toxicity would tend to decrease as you move up the graph.

Option 4 with the additional biological testing that are proposed will determine at what point as you move up on that graph that no additional biological effects are observed. If you go beyond that point, as staff has pointed out, there may be, in fact, environmental harm that's caused.

To go further up the graph is wasting effort, and it's wasting money without any additional environmental benefit. That is what I meant earlier when I referred to cost-effective cleanup.

We believe that with approval of additional testing and the work plan, we can start the program within three weeks. We've already submitted all dredging applications to the appropriate agencies, and we continue to voluntarily work with staff and with the Board to try to implement a plan that will protect beneficial uses and water quality.

We would recommend that the Board adopt Option 4 and authorize us to do the additional toxicity testing. Thank you.

CHAIRMAN BAGLIN: Mr. Minan has a question.

MR. MINAN: Actually, I have a couple of questions. I'm trying to get an assessment of the economic impact of the background cleanup, and there are three areas that I don't know whether you're the right person to answer this or maybe one of your staff or colleagues here today would be able to help me figure out the economic consequences.

First, on your building contracts, do you have an environmental remediation pass-through provision so that some costs that might be related to remediation would be passed through to a contractee with you?

MR. CHEE: I'm really not the right person to be asking that question.

MR. MINAN: Is there somebody who could answer that from your group? I'd also like to know if you've ever made a claim under any contract for remediation cleanup costs with any of your contractees.

MR. SACKETT: Richard Sackett on behalf of National Steel & Ship Building. Mr. Minan, I don't have the answers. What I wanted to promise you is that we do have -- I believe the comment period has been extended for a full week, and I'm writing your questions down. I'll be glad to respond to those in writing and give you the full answer to those.

MR. MINAN: I appreciate that. There are a couple other questions that I have also.

MR. SACKETT: I'm going resume my seat and write them down, thank you.

MR. MINAN: The second area that I'm interested in trying to assess the economic impact to not only you but to any of the other shipyards in this area, is to what extent do you expense as an ordinary business expense, any remediation costs that you might incur with regards to a project like this, or capitalize those costs, or take advantage of Section 198 of the Internal Revenue Code provisions, which I alert you are due to expire at the end of this year. So how you deal with these costs as a practical matter certainly would influence my thinking on the issue.

MR. SACKETT: I do have somewhat of a reply, although it's certainly different. And I think I would beg to differ --

CHAIRMAN BAGLIN: Your name again, sir.

MR. SACKETT: I'm sorry. This is Richard Sackett again with NASSCO.

I beg to differ somewhat with Attorney Richards' characterization of the cost issue and the cost analysis. We believe that under 92-49 and the code, the issue of cost is not an absolute cost. It isn't whether we can afford to do it or not.

The question is what's the most effective use of funds in order to achieve the required environmental benefit. Whereas, if I can achieve the environmental benefit for X dollars, I'm not required to spend X-plus dollars to achieve more that isn't required by law to restore beneficial uses.

The key is what do we have to do to restore beneficial uses, and we propose a program that we think will address whether or not beneficial uses are, in fact, being harmed. There's testing that's going to be done, and that will answer that question.

MR. MINAN: I appreciate your position. It would be interesting to me to know how you deal with the remediation costs.

MR. SACKETT: We'll still do that for you.

MR. MINAN: There's just one other line of inquiry that I have of an economic nature, and that is to what

extent do your environmental liability insurance provisions permit you to make a claim against your insurance companies that would, in fact, bear all or a significant portion of the cost of any remediation, because obviously that would affect significantly the analysis with regards to certainly background levels, not so much with regards to what you are proposing.

So those are three areas in the realm of economics that would be interesting to me.

MR. SACKETT: Got the questions, thank you.

MR. PIERSALL: I have a question. Anybody here to answer it?

It seems to me that for about the past 40 years you guys have been throwing pollutants in our bay, and my question is why you shouldn't be responsible for cleaning up those pollutants that you put in there, period.

MR. CHEE: Couple of thoughts on that. I mean, we heard in the earlier presentations today about the whole issue, nonpoint source runoff from the entire community in this area. And while NASSCO obviously has had storm water discharges from our facility, there has been throughout the entire watershed area, a lot of discharges that would be considered contaminated stormwater.

And I think without the controls being in place that you could isolate, I think that is a very difficult statement to make, that NASSCO has or any other entity, whether it's a shipyard or not, has been discharging continuously for a 40-year time period.

MR. PIERSALL: I don't think there's any question that they have been. Now, how much they have in addition to the storm drain problems, I'm not really sure. But I think the studies that have been made in that area pretty well point to the shipyards being a major discharger in there.

CHAIRMAN BAGLIN: Any other questions for Mr. Chee?

DR. DAY: First, why do you suggest that your area or your levels should be set just by your own footprint rather than by background No. 3, or background No. 2, or background No. 1?

MR. CHEE: Mr. Day, what we were trying to get to the point of is that there is a point where instead of just looking at chemical values, you need to look at the biological effects that are occurring out in the bay, are you, in fact, causing harmful impact to the bay, are you affecting the beneficial uses, are you affecting the water quality.

And without doing toxicity testing, we don't believe that you can answer that question by just looking at chemical values whether they're at our site or other sites for a reference. The toxicity testing is a key

component that is currently missing.

DR. DAY: Perhaps I misunderstood your presentation, but I thought you were disputing the choice of the staff to pick as a comparison station No. 3, and you wanted a station within your own area.

MR. CHEE: I don't believe that was part of the presentation. Are you referring to part of the material that we had submitted to you?

DR. DAY: No. On the slides.

MR. CHEE: We didn't argue with the reference station.

DR. DAY: I see, okay. I think I also heard, perhaps again mistakenly, that doing additional bioassays or testing would cost almost as much as the benefits or something to that effect. What was that statement?

MR. CHEE: It was the statement that as you -- if you go in now and do -- build on the work that has been done throughout the bay and do biological testing based on that, you have a certain expense associated with that.

If you now go in to developing a site-specific AET, you're in essence ignoring all existing data and starting again from scratch. So your cost jumps considerably, but you end up at the same point. So you end up with the same answer as to what level do you need to

clean up to to protect beneficial uses and water quality, and that was the point that I was trying to make on the difference between a site AET.

DR. DAY: Well, I still don't understand, but I'll think about it.

MR. RICHARDS: Mr. Chairman, I'd like to ask Mr. Chee a question. If I'm not mistaken, what you're proposing to do is achieve a cleanup that will be not significantly different in terms of toxicity and impact on beneficial uses than what exists in the bay at large.

MR. CHEE: Correct.

MR. RICHARDS: Which is to say background.

MR. CHEE: Correct.

MR. RICHARDS: So you are proposing that NASSCO would clean up to what amounts to background, not necessarily in terms of chemical concentrations, but in terms of toxicity, impacts on the environment, diversity of the community, et cetera, et cetera, et cetera.

MR. CHEE: That is the key point that we don't want to be just assuming a cleanup standard, but determine the difference between our site and the reference stations from a toxicity standpoint, a biological effects standpoint, that there is no difference --

MR. RICHARDS: So you'd be saying that background might differ in terms of concentrations from reference

station 3, but that the outcome of your cleanup would be a restoration of the level of beneficial uses, the biologic diversity, the health of the community that would be tantamount to background?

MR. CHEE: Yes, it would.

MR. PIERSALL: I have a question on that. Maybe I didn't understand the connotation of "background." My definition of "background" would be clean up to the point where if the shipyards had never been there, what would the background be there.

In other words, not to go to some point in the bay and say, okay, we'll clean up to this level. Now, that whole cotton-pickin bay is pretty polluted. I wouldn't eat a fish out of there, or I wouldn't swim in there at all, anywhere in the bay. And I wouldn't want the cleanup just to keep it at that level.

I mean, we got to start somewhere to clean up that bay. If we just clean it up to the level, to the highest level it is right now, we'll never get it cleaned.

MR. RICHARDS: I think there is certainly a range of conditions that might be deemed background. The background conditions that are addressed in the technical report that you've got do not reflect pristine background conditions of San Diego Bay before urban development and industrial development.

I think you have to make a judgment about what level of background environmental quality, what level you're going to set to represent background water quality and background environmental quality.

DR. DAY: Doesn't Porter-Cologne refer to background as what exists now?

MR. RICHARDS: Porter-Cologne doesn't really refer to background.

DR. DAY: There's some statements I remember where --

MR. RICHARDS: In Section 13304 it simply says that you have the authority to require that waste that has been discharged be cleaned up, and the presumption of that language is that all of the waste that was discharged should be cleaned up.

It also says that you have the authority to require abatement of conditions of pollution and nuisance associated with that discharge. Porter-Cologne does not define what "background" is, and it leaves it up to you as a board. You as a board establish the minimum levels at which pollution -- the pollution threshold which is where water quality objectives are, and that establishes the water quality that's necessary to sustain the beneficial uses that you've identified.

And then the state board's

anti-degradation policy says that where water quality is better than it needs to be in order to sustain the beneficial uses, in other words where it's better than the water quality objectives, you should not allow degradation of water quality below that background level, which is to say -- but that is the existing background level at some point in time, and certainly background levels vary over time.

But you have to make a policy judgment about which background level you're going to deal with in setting something like a background level as the basis for a cleanup.

DR. DAY: If I understand the thrust of Mr. Piersall's question, it wouldn't seem to me to be reasonable to expect that we would define background to be something that we could somehow extrapolate backwards in time to be before the Porter-Cologne Act.

MR. PIERSALL: As I stated a while ago, I wouldn't want to say, okay, are we going to take a point somewhere in that bay and say that's the background when the bay is polluted. And I don't think we can -- we probably had a hard time finding a place in that bay to take a sample that would even qualify for the beneficial uses.

MR. RICHARDS: This discussion all is premised on

the presumption that background is better than it needs to be in order to sustain the beneficial uses.

MR. PIERSALL: I don't think that's true.

MR. RICHARDS: If that is not true and background is polluted, then this discussion becomes meaningless, and the only acceptable cleanup level is cleanup to the threshold of pollution or beyond, but the issue of background becomes mute. You certainly could not set a cleanup level below the threshold of pollution.

CHAIRMAN BAGLIN: May I jump in? I think that we're learning a lot through this process. A key thing for everyone to remember is we have another hour of testimony to come before us, so we might want to save some of our ideas and so on at the end, and we can do it especially if we're giving opinions. Hold that, and let's listen to the testimony and move ahead if we can.

THE REPORTER: Mr. Baglin, can we take five minutes before we go on to the rest?

CHAIRMAN BAGLIN: If we can reconvene at 3:20.

(Whereupon, a brief recess was taken.)

CHAIRMAN BAGLIN: Good afternoon. If we can reconvene the meeting at this point in time, and I am trying to allow those who are representing the shipyards to come up first. Mr. Hartnett, are you representing -- I see here now it's the unions of NASSCO employees, so

you're invited to make your comments.

CHRIS HARTNETT,

MR. HARTNETT: Good afternoon, my name is Chris Hartnett. I'm a representative of the United Waterfront Council that has six unions and the craft workers that work there at NASSCO every day, approximately 2,000 people.

I don't know anything about AETs and ERMs. I do know about the environment that these 2,000 people have to put up with every day. As a ship is completed and put into the water, these people work in an open-bottom dinghy, and they are subject to the spray that comes off of the ocean.

For instance, today when the wind is blowing, they end up ingesting some of that water that comes off of the ocean. They put up with the environment that NASSCO has them work in every day, and it's not a healthy environment.

They don't know anything about AETs and ERMs. All they know is they go to work every day, and they put up with this environment. And we would hope that you would take heed to the fact and request that -- and keep NASSCO's feet to the fire, and bring the bay back to something that is a plausible working condition for these people to work under every day, whereas now it's not. And

I thank you very much.

CHAIRMAN BAGLIN: Thank you, sir. I believe there are three representatives from Southwest Marine who wish to talk. First I have Shaun Halvax?

SHAUN HALVAX,

MR. HALVAX: Yes, thank you very much. Thank you Mr. Chairman, members of the Board, my name is Shaun Halvax, and I manage environmental affairs for Southwest Marine. My presentation today is not going to take more than 10 or 12 minutes.

CHAIRMAN BAGLIN: 10 or 12 minutes? Is that all three of you combined?

MR. HALVAX: Yes.

CHAIRMAN BAGLIN: We have five minutes per person.

MR. HALVAX: Yes, yes, five minutes per person.

Southwest Marine recognizes its responsibility to the sediment quality within the leasehold since its tenancy at the facility which has been about 20 years. Southwest Marine is looking forward to this board resolving and establishing cleanup standards for the shipyard.

We believe your staff has done a very good job in identifying, assessing and illustrating the data that has been accumulated to date on the other sites as

well as Southwest Marine.

There is a significant amount of chemistry-related data at Southwest Marine. I think somebody spoke here earlier about the fact that additional biological assessment is being contemplated to coordinate that chemistry to look at exactly what's going on in the sediments at Southwest Marine.

We would like to briefly overview some points that talk to and are related to the alternatives and the options being presented, and I would also like to briefly discuss the costs. Southwest Marine has provided costs to your staff to look at how each option is derived within those costs.

There are several factors, as you can see by tables 1 and 2. And generally speaking, for Southwest Marine, the ERM is approximately three feet of dredging throughout the shipyard. The ERM and background are very similar at Southwest Marine because we're a relatively small facility.

And then the other end of that, the Campbell AET would be approximately four and a half feet of dredging within a particular isopleth that is in the dredging plan that's been designed.

With that, I'd like to introduce Ms. Lucinda Jacobs from Exponent Environmental Group who's going to

summarize some of these points that we'd just like to bring to your attention, and then concluding remarks by Mr. Dave Mulliken to finish our presentation. Thank you very much.

LUCINDA JACOBS,

MS. JACOBS: Thank you. We very much appreciate the opportunity to provide comments, and we also understand and appreciate the desire of the regulators and the community to protect and improve the beneficial uses of San Diego Bay.

We've been working with the shipyards for several years now and with the staff to develop sediment cleanup approaches for sediments in the bay that are based on sound scientific principles. We agree wholeheartedly with the staff perspective on Options 1 and 2.

The cons for these options far outweigh the benefits, or the cons outweigh the pros. There's no scientific support for either of these options, and no other rational scientific conclusion could be reached. However, we also agree with the staff on Option 6. That is that no action is not appropriate for the bay.

We believe that refinement of the approaches embodied in Options 4 and 5 is the appropriate approach to take. These approaches integrate site-specific chemical and biological data to identify no effects cleanup levels

for the sediments.

The refinements that we offer to these two options address issues with the proposed testing program. There's a wide range of biological tests of varying degrees of ecological relevance that are available. The requirement of the proposed requirement for four different biological tests with nine different assessment endpoints is unprecedented for any environmental investigation of sediments.

Instead we believe that for sites like the shipyards, which have a limited set of chemicals with a limited potential to bioaccumulate, it's important to factor in ecological relevance of these different biological tests. For example, the larval tests that are proposed are generally less ecologically relevant than some of the other tests, primarily because the larvae that are used in these tests do not live in or on the sediments.

In contrast, the direct measurement of the life forms that live in and on the sediments is of the highest ecological relevance and is also a direct measurement of the most sensitive beneficial use as defined by the staff. These are the types of issues that we think need to be considered in refining the testing programs identified in Options 4 and 5.

We also think that refinements to Options 4 and 5 are preferred over Option 3 with its 20 percent safety factor primarily because they're based on some very sound scientific principles rather than an arbitrary safety factor.

I think in the overall cleanup it's also important to remember that the act of dredging sediments has adverse effects that need to be considered as noted by the staff in their report.

And, finally, for both the site characterization and site cleanup, it's important to balance the net environmental benefits against the costs, and that's been alluded to several times so far.

We will be addressing these issues in greater detail in our written comments and encourage you to seriously consider these views on these technical issues. Thank you.

CHAIRMAN BAGLIN: Thank you.

DAVE MULLIKEN,

MR. MULLIKEN: Chairman, I'm not sure I can do much to get these microphones any closer to me. I'm too tall. I'll just speak up.

Thank you for taking the time to hear from the representatives of Southwest Marine today. I think that the message here is that obviously everyone involved

in this in the first instance should be applauded for their extensive efforts that's been devoted to this. And I should say perhaps not only the effort that's been devoted to it, but the endurance shown by everyone involved in this. This issue has been before the Board for an extensive period of time.

Whatever decision the Board makes ultimately has to be grounded on good science. But in this context, I submit to you that good science and cost effectiveness or the cost-effective approach are one and the same.

Mr. Richards correctly reminded you that the operative sections of the Porter-Cologne water code that drive this say nothing sufficiently specific to constrain your decision and tell you what is the correct answer in black and white terms.

Indeed I submit that this entire issue is something that falls into a gray area. When the Porter-Cologne statute was enacted and Section 13304 cleanup and abatement order provision was incorporated into this statute, it envisioned abating discharges to water. It didn't really contemplate, if you will, in the first instance the remediation of sediments. We're dealing with a sediment remediation here as opposed to a direct discharge to water which is more or less, if you will, the natural and more traditional focus of Section 13304.

And I think the reason it's helpful to keep that in mind is because that slight significant difference really implicates a larger body of law, as Mr. Richards correctly alluded to nuisance concepts. Indeed if we were looking for a legislative framework that was on this kind of problem, probably the closest thing I would say would be the Federal Superfund Law, not really the Water Code or the Federal Clean Water Act.

And I say that for the very reason that the Federal Superfund Law does contemplate remediation of environmental problems that is appropriately environmentally protective, but in every instance is cost effective.

And I forgot which of the board members asked about this question, the issue of cost effectiveness is not simply a black and white issue. It can be effected or regulated on affordiveness or not afforded; that's not the issue. The issue is what is cost effective and necessary to achieve the environmentally protected result.

That is the result that Exponent has studied extensively and is recommending here which is, if you will, a suite of testing, biological testing as contrasted to chemistry testing in order to be able to intelligently determine what is the environmentally beneficial result

that is the result that will be consistent with protecting beneficial uses.

I think it is important for us to bear in mind that in understanding what those beneficial uses are, that the activities we're dealing with are shipyards, and none of the operative planning documents contemplate eliminating shipyards from the face of San Diego Bay.

The goal here is to achieve what is environmentally beneficial to protect beneficial uses of the water and to do so cost effectively. I think the direction the staff seems to be going will accomplish that result, and I understand this is a complex topic, but I think ultimately it's one that is susceptible from being resolved in an appropriate manner.

We were determined to stick to our time limits here, and so I thought I could perhaps at least in part take a crack at answering some of the questions that Mr. Piersall and Mr. Minan had addressed to the NASSCO representatives. But to make sure I didn't miss the opportunity, I did want to make two quick comments, if you will, on process issues.

You're still in the evidentiary accumulation process, if you will. The comment period will remain open here for another several days. The staff obviously is challenged with digesting a lot of material here. I find it somewhat unusual that as we proceed to a decision, you're doing so without the benefit of the staff recommending what they think is the right answer.

Now, I understand in fairness they're trying to lay out the array of options and do the very best job they can in analyzing the pros and cons in each of those, and I think that's very useful. But as the evidentiary accumulation process comes to an end, it seems to me it may be useful that as you deliberate this issue in November, that you have the benefit of the staff recommendation.

A second point that I would say, and I will make it clear on this issue that we simply speak for Southwest Marine, but when you have enacted a resolution, whatever that may be in Southwest Marine's case, at least it's our view that that should then be followed by a cleanup and abatement order. I believe that the statutory underpinning, if you will, is Section 13304, and that would be the appropriate thing to do.

Again, I want to make sure we didn't run over our time. If it's appropriate or if the Board wishes, I would be happy to take a crack at a couple of questions that perhaps were not fully answered in the previous --

CHAIRMAN BAGLIN: Since the time limit has been extended for written materials to come in, I think we prefer that you probably address them in those materials.

MR. MULLIKEN: Okay. Thank you very much.

CHAIRMAN BAGLIN: The next three speakers: Nicole Capretz, Cara Franke and Jim Peugh.

NICOLE CAPRETZ,

MS. CAPRETZ: Good afternoon, I'll pass this out real quick. As I was thinking about what I was going to say -- oh, my name is Nicole Capretz with the Environmental Health Coalition.

CHAIRMAN BAGLIN: Can you also describe what's being passed out.

MS. CAPRETZ: Oh, sure. This is a very rudimentary graph of my understanding of the issue that will hopefully clarify our position and why we hold the position we do. I don't know if that will accomplish what I'm hoping it will, but maybe it will.

So, like I said, last night as I was trying to determine how I was going to approach speaking about this issue, I wanted to try to distill the issue as much as possible, try to clarify and simplify what the bottom line is.

CHAIRMAN BAGLIN: Sorry to interrupt, but since you passed these out, Art has additional copies and if anyone who is a party to this wishes to see a copy of what was passed out, you can get one.

MS. CAPRETZ: That's fine, if they can understand it. Now I lost my place.

So the basic bottom line for us is that we have a very simple premise here. The shipyards have illegally discharged pollutants into San Diego Bay, and it is their responsibility to clean them all up. I think Frank Piersall articulated it best by saying just that, and that is the bottom line point.

So what I want to do with this graph is sort of show you the universe of what we're talking about. What we have -- unfortunately my numbers are wrong because of the recent staff report that I received -- is we have a total for NASSCO of 131,281 cubic yards of contaminated sediment. That's the entire universe of contaminated sediment.

So the first question for you is so what do we do with all this contaminated sediment? Well, first obviously like you guys have been discussing, you look at the law, what does the law say. Contrary or maybe consistent with John Richards, we believe the law is very simple and straightforward. You must clean up to background unless background levels cannot be restored, "unless" not "or."

You cannot clean to backgrounds or a lower level of water quality. You must clean to background

unless water quality -- unless background levels cannot be restored. And the way to determine if background levels cannot be restored is to look at the economic and technological feasibility.

We've seen no analysis done for this threshold question, and so for us it's imperative that this initial question be answered before we even consider adopting cleanup levels that are lower than background.

But just for argument sake because staff seems to be going along with the legal interpretation that the legal standard is protecting beneficial uses, I'd just like to draw your attention to the chart. And what we have obviously is showing all the contaminated sediment. On the left-hand corner you see the AET values.

This is the level at which the shipyards would like to clean up. This means that only -- and my numbers again are wrong, and I clarified them with the staff report -- only 9 percent of the contaminated sediment would be removed. This is providing the bare level, the bare minimum level of protection for beneficial uses of San Diego Bay.

The AET levels are at the edge of destruction. If the shipyards add any level of a contaminant onto the sediments at that level, they will become acutely toxic. They will be killing marine life.

Page 61

There's no safety factor involved at the AET. So they're not appropriate for cleanup levels.

Then you look at the AET, plus the staff has proposed a 20 percent safety factor. Well, then -- again, my numbers are wrong -- you're only going to be removing 13 percent of contaminated sediment. So what about the rest of the contaminated sediment? What's going to happen to the marine life that's still being exposed to elevated pollutant levels in the sediment?

We don't know. Science doesn't really answer that question for us. Science gives us tools to help us predict what might happen, but certainly we don't know. All we do know is that there's still going to be elevated levels of pollutants in San Diego Bay. That's not acceptable.

The only analogy I can think of in thinking about this is if there's a patient who has a malignant tumor in their body and the doctor says, well, I've spoken to the HMO and we decided that we're going to remove 9 percent of your malignant tumor because that's the most cost-effective thing we can do.

We feel that doing the risk benefit analysis, that removing 9 percent will insure that you won't die tomorrow, but it will also insure that we'll be able to spend the least amount of money. Well, this is

Page 62

shocking. No one would ever accept that as an acceptable solution for threatening the life of a human.

Look at it in relation to marine life. What you're saying is that if you use the AET value and you only remove 9 percent of the sediment, then you are still risking the life of all the marine life in San Diego Bay. Well, we find that a morally bankrupt position and not tenable and certainly not supported by law or the ultimate goals of the Clean Water Act.

Then you look at ERM levels. They're getting much higher up on the confidence level. Again, what these levels are really telling you -- they don't tell you a certainty of how much toxicity they're going to be removing from the bay, but they give you a predicted level.

So the ERMs -- and I have here that they would remove 95 percent of contaminated sediment. In reality the new chart tells me that it would remove 61 percent. But certainly we're getting to a more protected level.

Background is the only level at which we can be truly confident they're removing all of the pollution from San Diego Bay. This is a bay that you guys have already said is highly toxic, is not supporting beneficial uses of swimming and fishing.

We don't want to leave the legacy behind of

Page 63

not taking the opportunity to remove as much pollution as we can. And, again, it is definitely feasible to remove all the pollution in this circumstance. It is definitely technologically and economically feasible to restore the sediment levels to background, and it's imperative that you do that.

And going to the cost issue because that seems to be an issue of concern, in our opinion the only cost to consider is the price San Diego Bay and the marine life have had to pay from the onslaught of toxic chemicals that they've been exposed to.

In addition, let's not forget too that the public has been subsidizing the use and, I would say, the abuse of San Diego Bay by the shipyards. Because the shipyards have not once -- and for NASSCO's case 40 years or Southwest Marine's case 20 years -- ever had to clean up the sediment that they've contaminated. In addition, they've profited, they've benefited from not having to install pollution control technologies to stop that discharge.

And, finally, I think it is somewhat relevant that the shipyards are in an unprecedented level of financial stability right now. I think I included in my letters some articles discussing the contracts that both NASSCO and Southwest Marine have received.

Page 64

These are shipyards that are very financially secure and very capable of cleaning up all of their contamination, and we urge you to do right by San Diego Bay and restore the health of this patient. Please restore the levels to background. Thank you.

MR. PIERSALL: Nicole, what are you proposing as background level? We had this discussion as to what background level is, and my understanding is you go out to a spot in the bay and say, okay, here's the reference and you restore it to that. It's not necessarily as pristine as if the shipyards have never been there.

So you're going out to a bay that's polluted and saying, you restore this part to this polluted part.

MS. CAPRETZ: They tried to pick the site where they feel those sediments would be at if the shipyards were not there. If the shipyards had not polluted that site, this is the level of cleanliness those sediments would be at.

MR. PIERSALL: How do you pick that?

MS. CAPRETZ: Well, I believe they pick that based on sort of the urban runoff that might still exist at the shipyard site, and try to identify another site comparable in San Diego Bay. So that if the shipyards weren't there, then they would have the same level of contamination as another site.

Page 65

MR. PIERSALL: Who is "they"?
MS. CAPRETZ: Oh, the Regional Board staff.
MS. BLACK: Are you looking for this board to set a goal level in terms of cleanup -- well, I wrote it down. So you're looking for a cleanup goal that needs to be set and then cleanup levels? Do you see my question? In other words --
MS. CAPRETZ: Yeah, that could be one approach. It could be that you set the cleanup goal that, A, we want to remove 100 percent of the toxic sediments, and therefore the associated cleanup level would be background reference. Or you could say we want to restore the health of the bay or the sediments so that there is 0 percent toxicity or 2 percent toxicity, and that would be associated with the cleanup level as well, which would very likely be background reference.
MS. BLACK: So you're looking really from this board, you're looking for really both. One may be the goal, the base from which a cleanup decision would be made.
MS. CAPRETZ: Right. But I just want to reiterate that we feel strongly that the law actually mandates that you clean up to background, and making a decision about what your goal would be is almost secondary because the law in our opinion is very clear about the direction you're supposed to go, and that is -- unless you can give me

Page 66

evidence that you cannot restore these levels to background, then you must restore them to background.
DR. DAY: Do you have an answer to the concern that it may destroy the marine benthic community that's there now?
MS. CAPRETZ: That the cleanup may destroy the...
DR. DAY: The dredging.
MS. CAPRETZ: Well, I mean, my initial response is to say that the benthic communities there are already destroyed.
DR. DAY: That's really not true totally.
MS. CAPRETZ: Not totally, that's probably accurate. Like I said, that was sort of my first reaction. But certainly they're not in good shape. Certainly they're unhealthy, and I think we do have evidence to show that.
And, in fact, Southwest Marine in a recent litigation, a certain part of their facility was actually shown to have no life forms, to have no benthic community. So certainly there are areas that are dead zones at the shipyards.
I think that our main task is to do the best we can to restore the health of the bay and remove the contamination. And, yes, there is going to be some fallout. There is going to be some impact to the benthic community that we don't want.

Page 67

But, you know, using my cancer analogy, it's sort of like someone who gets chemotherapy. There are side effects, but you're always looking to your ultimate goal which is to restore the health of the bay or restore the health of the body for the human.
CHAIRMAN BAGLIN: Thank you. Cara Franke?

CARA FRANKE,

MS. FRANKE: Hi, good afternoon, Chairman Baglin and board members. My name is Cara Franke. I've been a resident of San Diego for five years now and currently a graduate student at San Diego State University.
Before making your final decision, I urge you to consider the effects that pollution has had on the residents of the community surrounding the shipyards. These communities are Barrio Logan, Sherman Heights and Logan Heights, and they are adjacent to the shipyards and share water boarders.
Many of the residents in these communities are suffering due in part to the pollution from the San Diego shipyards. I'm sorry, I lost my place. The sediment pollution in the bay has not allowed the residents to swim or fish in their neighborhoods, and those who do are putting their health at risk.
I urge you to put the rights of people

Page 68

before the right of big business and set up cleanup levels to background. This can help to restore both the health of the bay and the health and welfare of the San Diego residents who deserve to swim and fish in their bay. Thank you for your time.
CHAIRMAN BAGLIN: Thank you. After Mr. Peugh is Amanda Cross and Mario Terero.

JIM PEUGH,

MR. PEUGH: I'm Jim Peugh again representing San Diego Audubon Society. I had a really neat speech and there's so many things I wanted to say. I've already blown it, so I'll just use the introduction from it.
We really want to see copious and healthy fish and wildlife in the bay, and we want to see a full range of human uses in the bay. Partial cleanup is not fair to the citizens of San Diego and the citizens of California, and it's really not fair to future generations.
Now I'll get into the hardest part to say. Hearing the talk about the AETs, this idea of pushing really close to the threshold of mortality and interpreting it is a real strange way. First, I'm sure all of you have dealt with statisticians at one time in your life, and in dealing with outliers, data that doesn't fit the rest of the data, is always tough and it's always hard to deal

with.

When you saw on the AET examples where they had the row of green dots and then they had the red dots in the other direction, what they were doing was they were throwing away any data that doesn't agree with where the maximum green dot is. I can show you the foolishness of this.

If you can imagine a macabre test where we're going to see how -- we have a line of 20 cars in the parking spaces along the side of the road, and then we're going to see which one of those cars, is it car 12 or 18 or 20, you can jaywalk and get across without being killed. And so we have a bunch of people that have stopped, and we're using them for this test.

And so the first couple of guys run across, and then they start with car 20 and car 18, and they get across before the car coming down the street gets them. And then we have sort of a mixed, you know, some people make it and some people don't.

And then there comes along this really young strapping fellow in a car, and he says I can do any of this. He waits until the car gets just four car lengths from where he's going to run across, and he runs across. It happens to be a sports car, it's real little, and he's a hurdler and he jumps over it and he makes it.

So the apparent effects threshold now is four car lengths. You can actually get across the street with only four car lengths to spare. There are bodies all over, you know, there are red dots down the street that say that there's lots of mortality here, but this one guy indicates that the threshold is four.

They didn't go and look into any of those points to see how they were explained. They didn't look to see if there was a sports car and it was a hurdler. They were just throwing the points out if they don't agree with their threshold. That's bizarre; that's not scientific. You cannot functionally use a threshold that's based on that kind of thought.

The next is we're talking about -- as far as another safety factor that you're just not getting, you know, you go out and you make these measurements and you assume that the sediments are stable. You know, at some point you say, well, all the contaminants that are still there are down below this, so it's okay. The contaminants aren't stable; they're mobile.

Those neat little animals, the worms and the crabs and the things that they showed us are moving through this mud, and they're moving up and down. Towing cables off barges and ships will drag through the mud and disturb it. The other things that we do, prop wash will disturb

the sediments.

So if you're cutting it really close like this, you've got no guarantee that the measurements you make on what the contaminants are on top is going to be that way in the future. It won't be there.

Another one was the thing about -- the statement was that if you're above the AET level, that you're not disturbing beneficial uses and there is no biological harm. That doesn't make sense. All it tells you is that something didn't die.

There are other forms of biological harm. We know that contamination causes reproductive problems. The AET didn't measure that. So you can have a species or an individual or a group of individuals that will survive, but they'll never reproduce. Those have really been harmed.

We know now that there are levels for toxicity that won't kill you, but it will affect your immune system. So the toxicity won't get you, but your immune system won't cope with the next virus that comes along. That wasn't measured either. So there can be lots of harm still staying below that AET threshold.

So, again, the AET threshold is meaningless for determining biological harm for beneficial uses. And the only way I can see that you can get -- is the full cleanup. And, boy, knowing what background is, I don't

know how you're going to figure that out, but it really has to be taking out all the contaminants that have come from this industrial use.

And you talk about what's practicable. We aren't talking about huge numbers, unless I read those graphs wrong. They were talking about in one case to do the full background cleanup was $8 million, and then the full background cleanup on the other one is $12 million. Those are not huge numbers for a cleanup.

We're talking about a bay that's worth lots and lots of billions of dollars to us and future generations. We're talking about developments, single developments that will go in one of these locations of $300- and $400 million. If we can increase the desirability of a property like that, numbers like $8- to $12 million just are really not large numbers.

And then you can go back to --

CHAIRMAN BAGLIN: Jim, I'm going to have to ask you to wrap things up.

MR. PEUGH: Okay. I'll try real quick.

The issue is they're going to go out and clean up to the point where they have to by these indicators, and they've indicated that they'll go out to the full background level if they have to. That shows that cleaning to the background level is practicable. So

I think just the fact that they've made that offer means that you have no alternative but to go to the full background level if you can figure out what that is. Thank you.

CHAIRMAN BAGLIN: Thank you.

AMANDA CROSS,

MS. CROSS: Good afternoon, Chairman Baglin and board members. My name is Amanda Cross, and I'm a 21-year resident of San Diego and a concerned citizen.

In the political and social arena today we hear a lot about accountability, holding individuals accountable for their actions. It's equally important, however, that this be applied to the private sector. Private sector companies need to be held accountable for the effects that they have on communities and environments that they are located in.

On that note, I would ask that you hold the shipyards in San Diego accountable for the effects that they have had on San Diego communities, such as Barrio Logan, Sherman Heights and Logan Heights and the environment, and support holding shipyards, San Diego shipyards responsible for cleaning up San Diego Bay to background levels. Thank you.

CHAIRMAN BAGLIN: Thank you. Mario Torero?

MARIO TORERO,

MR. TORERO: We're going to be showing some slides. This is the map of Barrio Logan. My name is Mario Torero, and I am an artist and resident in Barrio Logan in the community. I've been working with Chicano Park for many years.

This is the area of Chicano Park in the waterfront, and there is the bridge down the middle. And on the left side is the little park there called Crosby Street Park. This little area there, it's the only outlet for all the southeast of San Diego, and this is where the people go and have some recreation.

Now, in that area there is a pier here next to a little beach. Of course it says no swimming nor any fishing. Although just north of this area on the other side of 10th Avenue landing there, there's another pier there in which they can fish right next to the Campbell cleanup.

Of course, in this pier there in Barrio Logan, although it says no fishing and no swimming, it looks pretty much like Shelter Island sometimes. Perhaps because people who are in that area do not get out of their own barrios into other areas, so they go there for recreation. But I know, we know that these people are eating the fish.

Also, you may say no fishing, but these kids there, they do not take the trolley nor the bus to get out of the area. It's very hot. They're there already. There's not much going on for activities for these kids. That's why I'm trying to create a cultural arts center there. But instead this is the way they recreate themselves. They go in the water and they -- you know, I did that when I was a kid in that area.

It's an ongoing thing that goes on no matter how many signs you put across there in no matter how many languages. I'm saying they need to put some showers at the end of that little park there that was built by the port.

So what we've done on our own is we've gone and tried to clean up this little beach. There's a little beach. It's called Kakito (phonetic) Beach. And we've been cleaning it ourselves with the kids. We bring canoes and a boat there to incite them to join because this water source here is right in our backyards, and we have never used it. And it's about time that we start using our own resource; right?

So this just happened two or three weeks ago. A nice article came out on it in the San Diego Union in which we say "Kids Take the Yuck Out of the Beach." Now, the kids went in the water on that day like they always do. We did not encourage nor discourage. We are just taking

the data down, and the San Diego Baykeepers helped us in making this thing happen. They have taken some samples of the water. We have still yet to see what the pollutants are.

But this is the area where the community -- and you know the impact of the numbers are tremendous there. And actually some people are just barely discovering the place because in the past years because of the wars between the barrios, the Shermans and Golden Hills could not come to Logan. But now that's in the past, and so there's more people coming to the waterfront.

Since we cannot keep the people out, we must clean the water for them. Even if we built a wall around NASSCO and the pollutants so they can contain their pollutants while they clean it out, at least stop this from getting worse anyway.

And the leaflet that I passed around is another event that we're doing this weekend which evolves around cleaning the beach. I called the port yesterday, and they're going to be going there to clean up only the dry land, but the water area is another situation which has to be taken care of. Thank you.

CHAIRMAN BAGLIN: Thank you. The last two speaker slips I have, first is Marco Gonzalez and then last is Laura Hunter.

MARCO GONZALEZ,

MR. GONZALEZ: Chairman Baglin, members of the Board, my name is Marco Gonzalez. I'm here as counsel for San Diego Baykeeper. I'm here to support EHC and to reiterate some of the points that we made in our letter regarding the sediment cleanup levels.

We understand this is a difficult decision that you have to make, but I'd like to make it much easier for you. I'd like to come back and revisit this wonderful State Water Board Resolution 92-49 and talk about one word, that is the word "if."

Now, those of you up here who are parents -- and I think all of you are -- use this word quite often with your children or have in the past, "If you don't clean up your mess, you're not going to go outside."

"If background levels of water quality cannot be restored," that is unequivocal. Before that you have this word "reasonable," and you have a comma after that clause. Attorneys, we take these sentences and we break them down into their most simplest pieces, and you have the sentence, "if background levels of water quality cannot be restored." Then comes "reasonable."

When you get to the reasonable level of water quality that you're going to choose if background levels cannot be restored, then you take into consideration

the full range of social, economic, tangible and intangible objects.

Now, I think Nicole hit the nail on the head. This resolution has two parts to it. It says technological feasibility is one large one. This isn't rocket science. You don't have to go out there and perform some amazing experiment or some amazing disappearance act in order to clean up the sediment. You have to go out with a big dredge, and you have to pull up a lot of dirt.

Now, where the cost comes in is you've got to dispose of that. And with all due respect to Mr. Day, there is this notion that you're going to resuspend the fine particles and that you're going to actually harm not only the communities that are living in the water column, but you're going to displace the existing benthic community.

Well, let's look beyond this week or beyond this month. We're talking about cleaning up the bay for some period of time in the future. Yes, there are going to be short-term impacts. Yes, when you pull up sediment, you pull up critters and you're displacing them. We're not saying that you're going to have to filter out all the critters and throw them back in the bay.

But the benthic community as has been shown in repeated studies throughout the bay is fairly vagile,

which means that they move around quickly. They have the ability to recolonize, and, furthermore, scientists can reintroduce these species given one point, they have to have clean sediment to recolonize. That is the imperative.

Now, I want to take you back real quickly to what you saw up on the screen by staff, and that was the description of what apparent effects thresholds was at the Campbell shipyard when they did their site-specific determination. You saw a line of green dots. Below that you saw hash marks with two red dots, solid with two more red dots.

Clearly two of those toxic spots were to the left of that line that they said was the threshold for toxicity. Clearly if you choose anything under the purview of apparent effects thresholds you are going to admit that you're going to accept some toxicity. That's unacceptable. The law says, if you cannot reach background levels. We have no showing that we cannot reach background levels.

We've had no economic feasibility studies shown. Instead what we get is this pullback, and it's not surprising to us that NASSCO would come forward and choose conveniently the least expensive option or choose a method that will allow them to tweak the science to show what is best for them.

And, similarly, we don't find it all that surprising that NASSCO and Southwest Marine have given you a ton of cost numbers without backing those up. It used to be $7 million. Somehow it jumped up to $12 million now. We need to start asking tougher questions and start mandating from them some more concrete evidence of their economic sustainability.

It's really disheartening to think about where these companies in particular make their profits. Because let's not forget, they are private industry but they make their money from contracts with the Navy. You and I support the Navy. We pay our taxes to the Navy. We pay our taxes to these people who dirty up the bay and then come back to us and say, sorry, we don't owe you anything more than the very bare minimum, apparent effects threshold.

There is no cost benefit analysis to be made here until you've reached that first portion of can-you-do-it, and I say we aren't going to meet that. When you start looking at the profits that these companies generate, $12 million ain't going to break the bank.

So to end on something that Laurie asked about what are we asking you to do here, the environmental community, to set a management goal and from that get a level. I'm going to say the policy that we know you're charged with making has already been determined by the state water board. It's not a difficult decision for you.

I think if you take a step back and look at what is the legally mandated requirement, it's not a cost benefit analysis. It's not how do we get the best bang for our buck. It's not let's draw a line to point at which the money we spend gives us the most for our return. It says can you do background, period.

CHAIRMAN BAGLIN: Thank you.

LAURA HUNTER,

MS. HUNTER: Yes, again, Laura Hunter from the Environmental Health Coalition. I always feel really old when this issue comes up because I've been dealing with it for so long, and, yes, I was there when Campbell's level got set.

And I would really like to just share some history with you so we can just dispense with even thinking or looking at the Campbell's level again when there were two things that were promised us when that level was set. No. 1 -- well, let me talk about conditions first of all.

The conditions under which that level were set was, one, we had no exhaustive bay protection toxic cleanup study. There's a huge effort that's happened since then. We did not have that. The port had no information

like that. We were also, very frankly, war weary.

Every one of these sediment cleanups that we had been through had been an all-out war through litigation, it went on and on. We were worn out. And this level was accepted as a compromise. We all knew it for two reasons and two reasons only. One, we were promised that it be no precedent for the other shipyards, and, two, we were going to get fast fast cleanup which we were all desperate for because the cleanups had been taking five and six and seven years.

Wrong decision, wrong strategy, admittedly. Compromise, once again, did not serve the environment. We shouldn't have done it, and I think hindsight is 20/20.

I want to touch on -- and, in fact, I'm sure you all remember there had been two one-year extensions to that order, so we really didn't get what we thought we were getting.

I wanted to touch on a couple of other points relative to Campbell's cleanup. At least one of the peer reviewers said that Campbell's AET was not even appropriately derived for Campbell. Not only is it not appropriate for our shipyards, but it actually wasn't appropriately derived for Campbell itself, that there wasn't enough samples. Other scientists disagree with that, but I think the best you can say about that level is

that the scientists disagree on it.

Next, the sediment levels of contamination are very different between Campbell and the other shipyards. Again, they're not applicable. I want to correct one thing that I think -- I'm worried that Vicente left an impression that somehow ERMs are not based on biological data.

Actually, I believe they are based on biological data, lots of different studies. And it's a median or a 10 percent at which this biological data showed effect. I think it's really a measure of confidence level in terms of biological response, but I don't think it's accurate to say it's not based on any biological data.

There was a statement made by Mike Chee from NASSCO that earlier boards never set a cleanup level at background. Well, there's a couple responses to that. I'll just refine it to a very few. First of all, it's irrelevant. Most of those levels except for Campbell's were set between 8 and 13 years ago.

Again, there is a lot of information we have now that we didn't have then, and probably the bay is more polluted now than it was then.

I also want to point out this issue of resuspension because I think that this in this case is a red herring. First of all, generally we say the dredging

has an immediate effect; it kills what's there. But it also has the resuspension effect. Those sediments in the shipyards are getting resuspended every day by the prop wash, I mean, they are constantly being resuspended.

I think where this kind of argument is valid is in a place like Convair Lagoon where the contaminant you're dealing with is in deep in the sediments. And if it is dredged up, it is resuspended and then it is biocumulative. So at any level it's dangerous. But Convair Lagoon has no resuspension mechanism, and we've removed any possible resuspension mechanism from that, and that's why boats are kept out of there, so we don't resuspend it. It's not really an applicable issue here.

The levels selected for Paco, that was copper ore. That was a very very different kind of contaminant, a different kind of waste and is not an applicable level to use with this point.

Just a couple other random points in response to what I've heard. Insurance companies paid for lots of sediment cleanup at other sites, and I think you're on the right track to ask just how are they going to claim on that.

And I want to point out that frankly this is not all that hard. Look how much dredging the Navy has done in the past few years, millions and millions of cubic yards they have dug, some of it contaminated. So it's been my experience that the polluters have fought these cleanup orders, but once they've lost, which they always have, the cleanup gets underway and it goes very quickly.

And it always seems to come down to a question of will the polluters spend their money fighting cleanup or spend their money cleaning up. And once we get them cleaning up, it does not take that long and it's not that hard. We urge you to direct them. Thank you.

CHAIRMAN BAGLIN: Thank you. Those were all of the speaker slips that I had on the subject. Did I miss anyone by any chance? Then I'll close the public comment and call for board action.

John, could you clarify for us again the action that you are asking from us today, help put it together for us, and then what happens after that.

MR. ROBERTUS: The action today was to conduct a public hearing and take testimony on this matter. Because the staff report was so extensive, and it was a dynamic document, by the time we got it out we immediately were notified that people wanted more time to look at it. So I made the decision after talking to the chair to extend the public comment period beyond today's meeting. But today basically afforded the opportunity for the public hearing.

We will be waiting for public comment to

come in in written form and close it -- I'm not sure of the date.

MR. RODRIGUEZ: The 19th.

MR. ROBERTUS: The 19th of this month. And then the public comment period would be closed, and we would prepare staff a review of documents and staff comments that would be provided to you for next month's board meeting, regularly scheduled board meeting, to then make a decision and have board discussion on the comments that have been submitted.

It is not anticipated at this point that there would be a further need for public comment in the oral form, a public forum.

CHAIRMAN BAGLIN: So then it's appropriate now for us to if we have any questions, any clarification that we think we need to perhaps discuss that. But as far as actually discussion to arrive at might be premature at this point in time because we'll be getting more written for the next meeting.

So our action will be at the next meeting, and anything right now would be if we have any questions, clarifications to staff or if we wanted to make any comments that those who are present, that they may wish to get written materials back into the file also that would help us in our determination next month.

MR. PIERSALL: One of the things that I would like to see staff do is come up with, I guess, a numerical value. If we say, for instance, I would like to see the contaminants taken out. Now, I don't know whether that's to background level or beyond background level or what. But I would like to see the contaminants and the toxics removed, period.

If that's not possible, I would at least like to see them removed to a certain level, a fairly low level. I'm not sure what that level would be, but that's what I would like to get information from the staff as to what would be a reasonable level to make sure that as much toxics be removed as possible. You understand my concern there, John?

MR. ROBERTUS: I thought that's what we've been trying to do.

MR. PIERSALL: Well, there's been some question about what is background, and my understanding of what John says is you can go out and you pick some spot, and you say, okay, we're going to use that as a background. And if you do that, then I'd like to know what level of contamination is in that background because I don't know where and how you would select it. I don't know how you would go out on that bay and say, well, we'll just select right here and use that as a background level.

MR. ROBERTUS: Well, we pointed out that there is a point in the bay, a location. It was location No. 3 on the overhead that Vicente Rodriguez briefed you on. And we got the highest correlation of the three background points of 70 percent with the characteristics of the site and the characteristic contaminants. The match was the closest of the background locations where we had the chemistry data.

So that's what we are using at this point, and that's our recommendation if that is background. The the definition for the background point, however, is in terms of chemistry, sediment chemistry. We do not have the infauna data, the inventory of what is out there, the biodiversity of what is living in background, and I don't know that I can do that by the next board meeting. I'm confident I cannot do that by the next board meeting.

MR. PIERSALL: I think that's going to have to be part of what we're looking for. If we have biological contamination in there, we don't want to say, well, just remove the chemical data, chemical effects and don't worry about the biological. I don't think that's what we want at all, because both of them have got to be part of the solution.

MR. ROBERTUS: Perhaps I can take a couple of minutes and bring it back to the reference point that I pointed out when this agenda item began today, and that is the last time this board looked at this issue, the Board made a decision to use the AET level at the Campbell shipyard which was derived with what you're calling biological information and sediment chemistry information. And the AET value would be used as it had been at Campbell, it was to be used at these other two shipyards that have been discussed today.

And at that point in time, there was some concern that it might not be appropriate to take an AET from one shipyard and just generically transfer it to another one even though staff recommended that because of the proximity and the similarity of activities and pollutants.

So since that date March of 1999, we have been trying to get more information that you could use to make your decision. And, in fact, the economic information is derived from a model that was developed by the state board assisting us. So you have a lot of information about the economics of this decision that you did not have previously.

There are a number of other things that are ongoing, and we will continue to learn more. The problem is that the longer, the more time it takes the more information I will be able to get and bring to you, but the contamination or pollution of the contaminants remain in

place.

What I can't tell you is whether or not the cleanup levels at the previous sites in the bay that were cleaned up to AET either are or are not protective of beneficial uses. That's one of the problems that we have. After the cleanup is completed, I can't tell you -- I like to use the canary in the mine comparison -- that, yes, it does in fact now support the array of beneficial uses that exist in the bay at any one of these sites. That's the nature of the decision.

MR. PIERSALL: It's my understanding that the biological data was not considered on the Campbell yard.

MR. ROBERTUS: That's correct. In August of 1995, a letter was sent to the shipyards, to three shipyards requiring -- and this was by the executive officer's signature at that time -- requiring them to do a full assessment of the contamination at the leaseholds for the shipyards.

Campbell did, in fact, do that complete work and presented it, and today we now have their AET that is well-known. NASSCO and Southwest Marine never did do that assessment. They did chemistry work, but they never did the workup for the toxicity information because it's very expensive.

MR. PIERSALL: Did Campbell?

MR. ROBERTUS: Campbell did do it, yes.

MR. PIERSALL: So we do have biological data from Campbell.

MR. ROBERTUS: Yes, and that's why that data -- to use that data at the other two shipyards was requested by NASSCO and Southwest for two reasons. First of all, it's a cleanup level, and second of all, it's an AET value that was already obtained at great expense by Campbell. They requested that it be used, and the Board made the decision that it could be used.

MR. PIERSALL: So is staff recommending the AET level from Campbell or the other yards? Is that what you're saying, using that as a background level?

DR. DAY: No, they gave us five options.

MR. ROBERTUS: Not today. I do not have a specific recommendation for you today.

MR. PIERSALL: I'm still trying to get to where you took the background level from. Did we take that from Campbell's yard or some other spot?

MR. ROBERTUS: The recommendation at the last board meeting when the Board decided to issue the interim cleanup levels were derived from, first of all, the Campbell shipyard cleanup -- oh, the background? The background was from the three points that were briefed today by Vicente Rodriguez and not at Campbell.

DR. DAY: They're away from the shipyards.

MR. ROBERTUS: Yes, they're not in the shipyards.

DR. DAY: I mean, they explained the background very carefully.

MR. PIERSALL: What kind of testing was done in those background levels in order to come to that background level? In other words, if we say, okay, this is the background level we're talking about, do we know that it's fairly clean, that it's not toxic?

MR. ROBERTUS: No, the background levels are areas that are not clean, but they are impacted by all the other what I'll call ambient discharges that have historically and are currently impacting the bay, but not the shipyards.

In other words, we're trying to find out what parts of the bay are the best representation of the ambient, the levels of contamination that have come from all other sources without getting too close to any one.

MR. PIERSALL: My concern and my question is, if we did an analysis of those background levels taken from those different points, would we have a reasonable level of cleanliness there, or is it still going to be contaminated?

If it's going to be contaminated, then it doesn't make much sense to me to take a contaminated spot and say, well, that's our background and you can clean up to that and we'll go along with...

MR. ROBERTUS: We don't know that. The first actual random sampling of San Diego Bay was done in 1998. There was previous sampling, but it was always skewed toward locations that were known to have contamination. And the Bight 98 sampling of the bay, the data is available, but the analysis is not complete.

So I don't know that. The staff in the last few years has designated certain points as what we feel are representative background locations and we've tried to rather than averaging all those values and saying here's an average background, we've tried to get a background location that is most representative.

MR. PIERSALL: It just seems to me it would be an exercise in futility to pick a spot for background level that we have no idea what's there.

MR. ROBERTUS: Well, certainly if we picked another background location, it would change I would hope very slightly.

MR. PIERSALL: My concern is can we pick a spot in there that's not contaminated to above the level for the community we're trying to protect.

CHAIRMAN BAGLIN: I've got some other people who want to ask some questions. Maybe you should...

DR. DAY: Is it fair to say that the three spots that the staff chose for measuring background are currently

having beneficial use, like sailing and swimming and things like that in the bay?

MR. ROBERTUS: Yes.

MR. PIERSALL: You can sail right across the area where the shipyards are too.

DR. DAY: Also swimming and they're not being condemned, and they're probably the best parts of the bay they can find. Now, it may be that all parts of the bay have some problems, but that's not the issue.

MR. PIERSALL: No, the issue is finding a spot that's not contaminated beyond the point of beneficial uses.

DR. DAY: And that's why I asked the question that I did. They're being used for beneficial use. The three background spots that the staff presented to us today are currently being used as beneficial uses. The area around the shipyards are not.

MR. PIERSALL: Well, just down from the shipyards in Logan Heights they're down there swimming and playing and all that. So they are using it.

MS. KELLER: Is it appropriate for me to ask a question of a representative from the environmental community?

CHAIRMAN BAGLIN: Okay.

MS. KELLER: Nicole, if the Environmental Health

Coalition was going to recommend one of those options, would it be Option 1? You know, we had the six options that they were presenting to us.

MS. CAPRETZ: Yeah, I'm forgetting. Was Option 1 clean to background reference?

MS. KELLER: To background reference, yes.

MS. CAPRETZ: Right, yes. Is that your question?

MS. KELLER: Yes, that is my question, and you could expand on some written comment too before the 19th. It might be helpful.

DR. DAY: Could I ask her a question?

MS. CAPRETZ: No.

DR. DAY: Did you believe that the three places that the staff chose for background measures were reasonable places?

MS. CAPRETZ: Yeah, we did. I mean, I'm definitely understanding Frank's point, but I think that we're trying -- I think what staff was trying to do was find sites in the bay that are comparable to what the shipyard sites would be if they weren't polluting into the environment.

In other words, there's still going to be contamination coming into the bay from all different areas, typically from urban runoff. So it's kind of comparable to what other sites would be if they just had urban runoff,

for example, as the pollution and they didn't have the shipyard waste. So, yes, the answer is, yes, we felt that background reference they chose was reasonable.

MR. PIERSALL: That's the kind of answer I was looking for.

CHAIRMAN BAGLIN: How about if Laurie could have the floor right now.

MS. BLACK: This is the proposal from NASSCO. It was actually fronted by a letter from Janice Grace (phonetic) on September 21. And on page 5 it says, "Moreover, remediation to background levels is not," and it's underlined, "legally required." So it's not legally required of NASSCO; however, is it legally required of us to make sure as we represent the waters, if you will, that it's to beneficial use? So they may not be legally responsible, but moral is another whole issue. But that being said, we have a legal obligation.

MR. RICHARDS: I think that the answer to that is that's a very simplistic statement to say that it's not legally required. It's a legal requirement basically.

Again, 13304 doesn't say anything about background, but it doesn't say anything about cleanup levels. What it says is it gives you the authority to require cleanup and abatement, and the presumption is that cleanup and abatement requires the removal of all waste and the abatement of all pollution.

So I would say that NASSCO is legally required to clean up to background under a rebuttable presumption, and the state board in interpreting that language in resolution 98-92 said that background is the starting point for your analysis. And in order to get to a cleanup level that is less good than background -- and this presumes that background is better than it needs to be to sustain the beneficial uses. To go less than background, you have to establish the fact that background is not attainable.

So NASSCO or Southwest Marine or, you know, Joe Bob's Ship and Boatyard would have to rebut the presumption that background is the appropriate cleanup level. It would have to show that it's not practical to achieve that cleanup level, and then we would set the alternative cleanup level.

Remember that you cannot have -- I mean, you cannot set a cleanup level that does not achieve unpollutedness. That's the question that Frank is raising is whether the reference sites satisfy the threshold of unpollutedness.

CHAIRMAN BAGLIN: Can I jump in? I see that Grace is about to run out of paper, and we have a lot of things I know that we have to talk about on this. But I'd like to

get direction on where you want to go now for our next meeting when we will have further written comments coming back.

Do you at this point in time as a board -- and we've gone through this before, and I don't know if I ever want to again -- want to close off public comment at this point in time? It will not be reopened at the next meeting. We will consider what staff provides us with new written comments. Or do you want to reopen it for public comment at the next meeting again?

MR. PIERSALL: I propose we close it, and we go with what staff gets from the comment period and have staff's position at the next meeting and discuss it from there.

MR. MINAN: I'd be inclined to reject that approach since there may be materials that are distributed to the Board that are worthy of continuing public comment. This is an extraordinarily important issue.

I realize the benefit and the efficiency of closing it at this point, but I am concerned that there may be certain materials that are given to staff that people may oppose and object to, may not have an opportunity to find out about those materials, and then we're, I think, in the danger of depriving someone of due process.

MR. PIERSALL: Are you looking for another

5-hour...

MR. MINAN: Well, these are important issues, and if it takes 5 hours the answer is yes. If it takes 10 hours...

CHAIRMAN BAGLIN: How about can I ask you, your positions have been stated here. Can I start down at this side and get yours and hopefully we'll get to a conclusion tonight.

MS. BLACK: I believe that this hearing was well-noticed. Anybody who had public comment is here. We may receive some more materials, some more letters, but that being said, I don't think that I'm going to need to have -- I have already read a lot of materials here, and I'm a lay person. I mean, I'm trying to understand the science.

I don't believe that anybody else is going to be able to stand up and give me any more information than I already need to come to some conclusions. I may receive more materials, and I welcome them to read them over the next month. So I would vote to close the public hearing.

MS. KELLER: I'm a little bit conflicted. I agree with Laurie, but then I agree with Jack. I'd like to hear what Counsel John Richards has to say about what are the legal ramifications of us closing the public comment

period, the public hearing.

MR. RICHARDS: I think in this case you're dealing with a policy question rather than a legal one. I think that Laurie is correct in saying that there has been adequate notice.

You are providing an opportunity for people to review the staff report and provide written comments. So I think that in terms of due process, we can defend the actions that you have taken by providing this opportunity for public comment, by providing further opportunity for written comments, and you do not need to provide further opportunities for comment to satisfy the requirements of due process. Whether you feel that you need to provide further opportunities to satisfy public concerns, it becomes a different issue.

MS. KELLER: I understand what you're saying. I mean, I can vote right now on the whole issue, so I think I'll just go with Laurie. I'm a little bit curious why we extended the public comment period, if you can shed some light on that maybe.

CHAIRMAN BAGLIN: I can check very easily. Mr. Robertus, could you respond to that?

MR. ROBERTUS: After talking to the chair -- actually, the complexity and the depth of the staff report, when people got that in their hands, we only gave them a couple of days to get the material back to meet the cutoff date for this hearing.

There was a request from a number of people in the public arena to give them more time, so I made the commitment and I conferred with the chair and made the commitment to extend the public comment period after the hearing.

MS. KELLER: Well, then I can go with Laurie, because I read every piece of paper in here, as painful as it is. So I'll read everything that I get for the next board meeting, and I'll be able to make a fair decision. So I'll go with Laurie; we're going to close the public hearing.

DR. DAY: I'm in favor of closing it. We've been here before. Once is a mistake, more than once is a pattern. I think that there's an infinite number of new things that can come to our attention, but I'll make only one point of many that I made the last time we were at this position, and that is that there's more than an infinite number of things which we have otherwise to do.

If we bounce something else off the agenda, we may come to regret it which I think is exactly what happened the last time we did this.

CHAIRMAN BAGLIN: I'm in favor on this issue of also terminating the public comment on it. So what I see

is that five of us are at that, and there's one dissenting vote on it. So this will complete our public comment on the San Diego Bay sediment cleanup level issue, and it will come back before us at our next meeting for final a determination.

MR. RICHARDS: Qualified by the fact that the opportunity for written comment remains open.

CHAIRMAN BAGLIN: Yes, it does. So, Mr. Robertus, can you remind me of what the cutoff date is for that written comment.

MR. ROBERTUS: The 19th of October.

CHAIRMAN BAGLIN: So with that, we will continue this item to our next scheduled meeting, and we will take a recess until 4:45, and then we will continue with Item No. 10.

(Whereupon, Item 9 was concluded for the day.)

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STATE OF CALIFORNIA
REGIONAL WATER QUALITY CONTROL BOARD
SAN DIEGO REGION

AGENDA

Wednesday, October 11, 2000
9:00 a.m.

Metropolitan Wastewater Dept. *Auditorium* *9192 Topaz Way* *San Diego, California*

The Regional Board requests that all lengthy comments be submitted in writing in advance of the meeting date. To ensure that the Regional Board has the opportunity to fully study and consider written material, it should be received in the Regional Board's office no later than 5:00 P.M. on Wednesday, September 27, 2000. If the submitted written material is more than 5 pages or contains foldouts, maps, etc., 20 copies must be submitted for distribution to the Regional Board members and staff. Written material submitted after 5:00 P.M. on Wednesday, October 4, 2000 will not be provided to the Regional Board members.

Pursuant to Title 23, California Code of Regulations, Section 648.2, the Regional Board may refuse to admit written testimony into evidence unless the proponent can demonstrate why he or she was unable to submit the material on time or that compliance with the deadline would create a hardship. If any other party demonstrates prejudice resulting from admission of the written testimony, the Regional Board may refuse to admit it.

Except for items designated as time certain, there are no set times for agenda items. Items may be taken out of order at the discretion of the Chairman.

1. Roll Call and Introductions

2. PUBLIC FORUM: Any person may address the Regional Board at this time regarding any matter within the jurisdiction of the Board which is not on the agenda. Presentations will be limited to five minutes. Submission of information in writing is encouraged.

3. Minutes of Board Meeting of September 13, 2000

4. Chairman's, Board Members', State Board liaison's and Executive Officer's Reports: These items are for Board discussion only. No public testimony will be allowed, and the Board will take no formal action.

Consent Calendar: Items 5 through 6 are considered non-controversial issues. (NOTE: If there is public interest, concern or discussion regarding any consent calendar item or a request for a public hearing, then the item(s) will be removed from the consent calendar and considered after all other agenda items have been completed)

5. NPDES Permit Issuance, Wesselink and Son Dairy, Riverside County (Tentative Order No. 2000-206, NPDES No. CA0109321) (John Phillips).

6. Waste Discharge Requirements: City of San Diego South Bay Water Reclamation Facility, San Diego County (Tentative Order No. 2000-203) (Dat Quach).

Remainder of the agenda (Non-Consent Items):

7. Adoption of an Order Concerning Administrative Assessment of Civil Liability against the City of San Diego for Sanitary Sewer Overflows. The Board will act on testimony received during the June 14, 2000 hearing and the discussion of Supplemental Environmental Projects during the August 30, 2000 meeting. The Board will consider adoption of an order addressing assessment and suspension of monetary penalties in consideration of Supplemental Environmental Projects (Tentative Order No. 2000-103) (Rebecca Stewart).

8. NPDES Permit Renewals (Todd Stanley):

   a. South Bay Boatyard, Discharge to San Diego Bay (Tentative Order No. 2000-213, NPDES No. CA0109126), San Diego County.

   b. Driscoll Custom Boats, Discharge to San Diego Bay (Tentative Order No. 2000-207, NPDES No. CA0109061), San Diego County.

   c. Driscoll's West, Discharge to San Diego Bay (Tentative Order No. 2000-208, NPDES No. CA0109070), San Diego County.

   d. Koehler Kraft, Discharge to San Diego Bay (Tentative Order No. 2000-210, NPDES No. CA0109096), San Diego County.

   e. Nielsen-Beaumont Marine, Discharge to San Diego Bay (Tentative Order No. 2000-211, NPDES No. CA0109100), San Diego County.

   f. Knight and Carver Yachtcenter, Discharge to San Diego Bay (Tentative Order No. 2000-209, NPDES No. CA0109088), San Diego County.

g. Shelter Island Boatyard, Discharge to San Diego Bay (Tentative Order No. 2000-212, NPDES No. CA0109118), San Diego County.

h. Oceanside Marine Center, Inc., Discharge to Oceanside Harbor (Tentative Order No. 2000-215, NPDES No. CA0109304), San Diego County.

i. Driscoll Mission Bay, Discharge to Mission Bay (Tentative Order No. 2000-214, NPDES No. CA0109291), San Diego County.

j. Dana Point Shipyard, Discharge to Dana Point Harbor (Tentative Order No. 2000-216, NPDES No. CA0109312), Orange County.

9. San Diego Bay Sediment Cleanup Levels. The Board will consider adoption of resolutions establishing Bay-bottom sediment cleanup levels for the following shipyards:

a. National Steel & Ship Building Company (NASSCO) (Tentative Resolution No. 2000-122) (Vicente Rodriguez).

b. Southwest Marine (Tentative Resolution No. 2000-123) (Vicente Rodriguez).

10. Status Report on the United States Navy Programs for Environmental Protection (John Robertus).

11. Report on Total Maximum Daily Load (TMDL) Programs in California. Dave Smith of the United States Environmental Protection Agency will provide his agency's perspective on TMDL development and implementation (David Barker).

12. Status Report on Tentative Order No. 2001-01, Waste Discharge Requirements for Discharges of Urban Runoff From the Municipal Separate Storm Sewer Systems (MS4s) Draining the Watershed of the County of San Diego, the Incorporated Cities of San Diego County and the San Diego Unified Port District (NPDES Permit No. CA0108758) (Deborah Jayne).

13. ***Executive Session*** - Consideration of Initiation of Litigation.
The Regional Board may meet in closed session to consider initiating criminal prosecution against persons who are alleged to have violated the Porter-Cologne Water Quality Control or the federal Clean Water Act.

14. ***Executive Session*** - Discussion of Pending Litigation.
The Regional Board may meet in closed session to discuss pending litigation.

15. ***Executive Session*** - Discussion of Ongoing Litigation.
The Regional Board may meet in closed session to discuss ongoing litigation for the following case: Non-compliance with Cease and Desist Order No. 96-52, Referral of International Boundary and Water Commission to the Attorney General by Order No. 99-61.

16. ***Executive Session*** – Personnel.
The Regional Board may meet in closed session to consider personnel matters involving exempt employees [Authorized under Government Code Section 11126(a)].

17. Arrangements for Next Meeting and Adjournment.
    Wednesday, November 8, 2000 - 9:00 a.m.
    City of Encinitas
    Council Chambers
    505 South Vulcan
    Encinitas, California

Notifications

A. On July 27, 2000, the Executive Officer issued Complaint No. 2000-166 to the City of Oceanside for violations of effluent limits contained in NPDES Order No. 2000-11. The violations meet the criteria of Water Code Section 13385 and are therefore "serious violations." Complaint No. 2000-166 proposed a mandatory minimum penalty of $3000. On August 28, 2000, the City of Oceanside submitted a check for $3000 in settlement of Complaint No. 2000-166 (Todd Stanley).

B. On July 27,2000, the Executive Officer issued Complaint No. 2000-167 to the City of Escondido for violations of effluent limits contained in NPDES Order No. 99-72. The violations meet the criteria of Water Code Section 13385 and are therefore "serious violations." Complaint No. 2000-167 proposed a mandatory minimum penalty of $3000. On August 15, 2000, the City of Escondido submitted a check for $3000 in settlement of Complaint No. 2000-167 (Chiara Clemente).

C. Pending 401 Water Quality Certification Applications (Stacey Baczkowski).

The State Water Resources Control Board revised State regulations for the 401 Water Quality Certification Program; these revisions went into effect on June 24, 2000. The revised regulations [23 CCR § 3830-3869] may be found at:

http://www.swrcb.ca.gov/water_laws/index.html or http://www.calregs.com/.

Section 3858 (a) states "The executive director or the executive officer with whom an application for certification is filed shall provide public notice of an application at least twenty-one (21) days before taking certification action on the application, unless the public notice requirement has been adequately satisfied by the applicant or federal agency. If the applicant or federal agency provides public notice, it shall be in a manner and to an extent fully equivalent to that normally provided by the certifying agency. If an emergency requires that certification be issued in less than 21 days, public notice shall be provided as much in advance of issuance as possible, but no later than simultaneously with issuance of certification."

Public notice of pending 401 Water Quality Certification applications within the San Diego Region is available on the Regional Board's web site at:

http://www.swrcb.ca.gov/rwqcb9/Programs/401_Certification/401_certification.html,

or by calling Paul Lemons at 858-467-3728 with questions about a specific project.

D. Public notification of Regional Board staff concurrence with the Corrective Action Plan (CAP) for a leaking underground fuel tank site (Site 21580) at Marine Corps Base Camp Pendleton, California (Jody Mae Ebsen).

On April 13, 2000 the RWQCB received a revised (CAP) proposing corrective actions at the leaking underground fuel tank Site 21580. Actions include excavation of fuel-contaminated soils and regular groundwater monitoring. The case files, site investigation reports, and the CAP are available for public review at the RWQCB office. The inclusion of this public notice as part of the RWQCB agenda fulfills the agency's obligation for public notification of the CAP document referenced above, pursuant to California Code of Regulations (CCR), Title 23, Division 3, Chapter 16, Article 11, Section 2728(a).

E. Public notification of Regional Board staff concurrence with Corrective Action Plan (CAP) for a leaking underground fuel tank site (Site 2459) at Marine Corps Base Camp Pendleton, California (Jody Mae Ebsen).

On March 22, 2000 the RWQCB received a revised (CAP) proposing corrective actions at leaking underground fuel tank Site 2459. Actions include implementation of biosparging and bioventing systems to enhance in-situ biodegradation of residual groundwater pollutants. The case files, site investigation reports, and the CAP are available for public review at the RWQCB office. The inclusion of this public notice as part of the RWQCB agenda fulfills the agency's obligation for public notification of the CAP document referenced above, pursuant to California Code of Regulations (CCR), Title 23, Division 3, Chapter 16, Article 11, Section 2728(a).

NOTES:

A. GENERAL STATEMENT

The primary duty of the Regional Board is to protect the quality of the waters within the region for all beneficial uses. This duty is implemented by formulation and adopting water quality plans for specific ground or surface water basins and by prescribing and enforcing requirements on all domestic and industrial waste discharges. Responsibilities and procedures of the Regional Water Quality Control Board come from the State's Porter-Cologne Water Quality Act and the Nation's Clean Water Act.

The purpose of the meeting is for the Board to obtain testimony and information from concerned and affected parties and make decisions after considering the recommendations made by the Executive Officer.

B. CONSENT CALENDAR

All the items appearing under the heading "Consent Calendar" will be acted upon by the Board by one motion without discussion, provided that any Board member or other person may request that any item be considered separately and it will then be taken up at a time as determined by the Chairman.

Any person may request a hearing on an item on the Consent Calendar. If a hearing is requested, the item will be withdrawn and the hearing will be held at the end of the regular agenda.

C. HEARING PROCEDURES

Hearings before the San Diego Regional Board are not conducted pursuant to Chapter 5 of the California Administrative Procedure Act, commencing with Section 11500 of the Government Code. Regulations governing the procedures of the regional boards are codified in Chapter 1.5, commencing with Section 647, of the State Water Resources Control Board regulations in Division 3 of Title 23 of the California Code of Regulations.

Testimony and comments presented at hearings need not conform to the technical rules of evidence provided that the testimony and comments are reasonably relevant to the issues before the Board. Testimony or comments that are not reasonably relevant, or that are repetitious, will be excluded. Cross examination may be allowed by the Chairman as necessary for the Board to evaluate the credibility of factual evidence or the opinions of experts.

The Chairman will allocate time for each party to present testimony and comments, to question other parties if appropriate; the Chairman may allocate additional time for rebuttal or for a closing statement; time may be limited due to the number of persons wishing to speak on an item, or the number of items on the Board's agenda, or for other reasons.

Unless modified by the Chairman, presentations will be made in the following order (the Chairman may allow questions regarding each persons testimony or comments after that person has finished speaking; Board Members, counsel, and staff may ask questions at any time):

1) Regional Board Staff
2) Discharger
3) Other Interested Persons
4) Closing Statements or Rebuttal by Discharger and Other Interested Persons
5) Recommendation for Action by Regional Board Staff

Note: If a hearing is requested on an item withdrawn from the consent calendar, the party requesting the hearing will testify first and the Regional Board staff will testify last.

All parties providing direct testimony are requested to remain for the entire hearing to be available for questioning.

The hearing will be closed after the staff recommendation; the Board may deliberate and act immediately following the hearing, or at some other time.

D. CONTRIBUTIONS TO REGIONAL BOARD MEMBERS

Persons applying for or actively supporting or opposing waste discharge requirements or other Regional Board orders must comply with legal requirements if they or their agents have contributed or proposed to contribute $250 or more to the campaign of a Regional Board member for elected office. Contact the Regional Board for details if you fall into this category.

E. PROCEDURAL INFORMATION

The Regional Board may meet in closed session to deliberate on a decision to be reached based upon evidence introduced in an adjudicatory hearing [Authority: Government Code 11126(d)]; or to consider the appointment, employment or dismissal of a public employee to hear complaints or charges brought against a public employee [Authority: Government Code Section 11126(a)].

The Regional Board may break for lunch at approximately noon at the discretion of the Chairman. During the lunch break Regional Board members may have lunch together. Regional Board business will not be discussed.

Agenda items are subject to postponement. A listing of postponed items will be posted in the meeting room. You may contact the designated staff contact person in advance of the meeting day for information on the status of any agenda item.

F. AVAILABILITY OF EXECUTIVE OFFICER'S REPORT AND AGENDA MATERIAL

A copy of the written Executive Officer's Report can be obtained by contacting the staff office. A limited number of copies are available at the Regional Board meeting.

Details concerning other agenda items are available for public reference during normal working hours at the Regional Board's office. The appropriate staff contact person, indicated with the specific agenda item, can answer questions and provide additional information. For additional information about the Board, please see the attached sheet.

G. PETITION OF REGIONAL BOARD ACTION

Any person affected adversely by a decision of the California Regional Water Quality Control Board, San Diego Region (Regional Board) may petition the State Water Resources Control Board (State Board) to review the decision. The petition must be received by the State Board within 30 days of the Regional Board's meeting at which the adverse action was taken. Copies of the law and regulations applicable to filing petitions will be provided upon request.

NOTE: If the State Board accepts a petition for review, the Regional Board will be required to file the record in the matter with the State Board. The costs of preparing and filing the record are the responsibility of the person(s) submitting the petition. The Regional Board will contact the person(s) submitting a petition and inform them of the payment process and any amounts due.

H. HEARING RECORD

Material presented to the Board as part of testimony (e.g. photographs, slides, charts, diagrams etc.) that is to be made part of the record must be left with the Board. Photographs or slides of large exhibits are acceptable.

All Board files, exhibits, and agenda material pertaining to items on this agenda are hereby made a part of the record.

I. ACCESSIBILITY

The facility is accessible to people with disabilities. Individuals who require special accommodations are requested to contact Ms. Lori Costa at (858) 467-2357 at least 5 working days prior to the meeting. TTY users may contact the California Relay Service at 1-800-735-2929 or voice line at 1-800-735-2922.

DIRECTIONS TO REGIONAL BOARD MEETING

Metropolitan Wastewater Department
City of San Diego
Auditorium
9192 Topaz Way
San Diego

Take I-15 to Clairemont Mesa Blvd. Go west on Clairemont Mesa Blvd. one mile to Complex Street - turn right. Complex Street curves to the left and turns into Topaz Way. The MWD building and main parking lot are on the right but if you continue about a half a block (just before Kearny Villa Road), there is another parking lot on the left.

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN DIEGO REGION

9771 Clairemont Mesa Boulevard, Suite A
San Diego, California 92124-1324

Information: (858) 467-2952
CALNET: (8) 734-2952

BOARD MEMBERS	CITY OF RESIDENCE	APPOINTMENT CATEGORY
Wayne Baglin - Chair	Laguna Beach	Municipal Government
Thomas B. Day - Vice Chair	San Diego	Undesignated Public
Frank Piersall	San Diego	Industrial Water Users
Laurie Black	San Diego	Water Quality
John Minan	San Diego	Water Quality
Janet Keller	Laguna Beach	Recreation/Wildlife
Vacant		Water Supply
Vacant		County Government
Vacant		Irrigated Agriculture

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Arthur L. Coe, *Assistant Executive Officer*
Lori Costa, *Executive Assistant*

State Board Staff Counsel
John Richards

State Board Member Liaison
Pete Silva

WATERSHED BRANCH
ichael McCann, *Supervising Engineer*

Watershed Protection Northern Region
Robert Morris, *Sr. Water Resource Control Engineer*
Rosalind Dimenstein, *Associate WRC Engineer*
Stacey Baczkowski, *Environmental Specialist III*
David Gibson, *Environmental Specialist III*
Elizabeth Lair, *Environmental Specialist II*
Christopher Means, *Environmental Specialist I*

Watershed Protection Southern Region
Mark Alpert, *Senior Engineering Geologist*
Kristin Schwall, *Assoc. Water Resource Control Engr*
Dat Quach, *Associate Water Resource Control Engr*
Cynthia Gorham-Test, *Environmental Specialist III*
Phil Hammer, *Environmental Specialist III*
Jane Ledford, *Environmental Specialist II*

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Frank Melbourn, *Assoc Water Resource Control Engr*
Rebecca Stewart, *Sanitary Engineering Associate*

Publicly Owned Treatment Works Compliance
Brian Kelly, *Senior WRC Engineer*
Todd Stanley, *Water Resource Control Engineer*
hiara Clemente, *Environmental Specialist II*
ictor Vasquez, *Water Resource Control Engineer*
Mona Dougherty, *Water Resource Control Engineer*
Robert Baker, *Retired Annuitant*

Industrial Compliance
John Phillips, *Senior WRC Engineer*
Paul Richter, *Associate Water Resource Control Engr*
Hashim Navrozali, *Water Resource Control Engineer*
Dan Phares, *Water Resource Control Engineer*
Whitney Ghoram, *Sanitary Engineering Associate*
Gloria Fulton, *Sanitary Engineering Associate*
Don Perrin, *Retired Annuitant*

Marine Waters
Peter Michael, *Environmental Specialist IV*

Inland Surface Waters
Greig Peters, *Environmental Specialist IV*

Watershed Management Coordinator
Bruce Posthumus, *Senior WRC Engineer*

WATER RESOURCE PROTECTION BRANCH
David Barker, Supervising Engineer

Land Discharge Unit
John Odermatt, *Senior Engineering Geologist*
Carol Tamaki, *Assoc. Water Resource Control Engr*
Brian McDaniel, *Associate Engineering Geologist*
Craig Carlisle, *Associate Engineering Geologist*
Amy Fortin, *Engineering Geologist*

Site Mitigation & Cleanup Unit
John Anderson, *Senior Engineering Geologist*
Charles Cheng, *Associate Engineering Geologist*
Vacancy, *Associate Engineering Geologist*
Laurie Walsh, *Water Resource Control Engineer*
Peter Peuron, *Environmental Specialist III*

Tank Site Mitigation & Cleanup Unit
Julie Chan, *Senior Engineering Geologist*
Corey Walsh, *Associate Engineering Geologist*
Sue Pease, *Environmental Specialist III*
Jody Ebsen, *Engineering Geologist*
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Water Quality Standards Unit
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Linda Pardy, *Environmental Specialist III*
Alan Monji, *Environmental Specialist III*
Lisa Brown, *Environmental Specialist III*
Lesley Dobalian, *Environmental Specialist II*
Tom Alo, *Water Resource Control Engineer*
Kyle Olewnik, *Water Resource Control Engineer*

International Border Activities
Vicente Rodriguez, *Water Resource Control Engineer*

Information Systems Management
Bob Rossi, *Staff Information Systems Analyst*

Business Support Services Unit
Vacant, *Regional Administrative Officer*

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Rina Dalyot, *Information Systems Technician*
Michael Gallina, Office Assistant

Administrative Support Services
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Vacancy, *Staff Services Analyst*
Denise Smith, *Office Technician*
Equilla Harris, *Office Technician*

Revised 9/22/00

STATE OF CALIFORNIA

REGIONAL WATER QUALITY CONTROL

BOARD SAN DIEGO REGION

Metropolitan Wastewater
Department Auditorium
9192 Topaz Way
San Diego, California
Wednesday, October 11, 2000

PUBLIC HEARING

ITEM 9

(Reporter's Transcript of Proceedings)

ITEM 9: San Diego Bay Sediment Cleanup Levels:
a. National Steel & Ship Building Company (NASSCO) (Tentative Resolution No. 2000-122)
b. Southwest Marine (Tentative Resolution No. 2000-123)

[redacted]

STATE OF CALIFORNIA

REGIONAL WATER QUALITY CONTROL BOARD

SAN DIEGO REGION

9771 Clairemont Mesa Boulevard, Suite A
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Information: (858) 467-2952
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APPEARANCES

BOARD MEMBERS:
WAYNE BAGLIN, Chairman - Municipal Government
THOMAS B. DAY, Vice Chairman - Undesignated Public
FRANK PIERSALL - Industrial Water Users
LAURIE BLACK - Water Quality
JOHN MINAN - Water Quality
JANET KELLER - Recreation/Wildlife

EXECUTIVE STAFF:
JOHN H. ROBERTUS, Executive Officer
ARTHUR COE, Assistant Executive Officer
MICHAEL McCANN, Senior Engineer and Ombudsman

STATE BOARD STAFF COUNSEL:
JOHN RICHARDS

INDEX

SAN DIEGO, CALIFORNIA; WEDNESDAY, OCTOBER 11, 2000

ITEM 9

CHAIRMAN BAGLIN: We will then proceed with Item 9, San Diego Bay Sediment Cleanup Levels. Mr. Robertus?

MR. ROBERTUS: Mr. Chair, this item was last before the Board for decision on the 10th of March of 1999 when the Board issued interim cleanup levels for the sediments in two shipyards located in San Diego Bay, for NASSCO and Southwest Marine.

At that time, the Board instructed me to proceed with efforts to find anything new that might be germane to the cleanup levels and to bring it back at such time as that information could be put together, and we provided a briefing on our activities at our board meeting last month.

Today Vicente Rodriguez is going to review the materials that have been sent to you for this meeting today, and potentially there is an opportunity for the Board to adopt resolutions to establish cleanup levels that may be different from what were previously provided in the interim cleanup levels for the two shipyards. So at this time, I'd like to turn the program over to Vicente Rodriguez for his briefing.

VICENTE RODRIGUEZ,

MR. RODRIGUEZ: First of all, I'd like to let you know that Alan is handing you my slides. Good morning, my name is Vicente Rodriguez. I'm a water resource control engineer with the Regional Board staff.

This morning I will be presenting Item 9, the Board's consideration of adopting resolution Nos. 2000-122 and 2000-123 which establishes sediment cleanup levels for National Steel & Ship Building Company and Southwest Marine shipyards. Tom Alo and Alan Monji are also here today to assist me in the presentation.

Today I will cover these five topics: why are we here today, additional clarification of the cleanup levels, Regional Board legal obligations and authority, options available to the Regional Board, and various outcomes from selection of the available options.

It looks like we're having technical problems with the computer. I'll just go ahead and continue off the slides that we handed to you.

Why are we here today? We're here because of two reasons: one, there are elevated concentrations of chemicals at the shipyards, and the second reason is a follow-up to a previous board meeting to bring this back to the Board.

The slide that's up right now shows the two

shipyards located within San Diego Bay. They are located approximately between Campbell Shipyard and the Navy facility by the Coronado Bay Bridge.

The two pull-out boxes show Southwest Marine's site and NASSCO's site. The area in green shows the aerial extent of contamination above ERM levels, and I will explain in more detail what an ERM is and why we use that as an indicator.

As I mentioned earlier, on March 10th 1999 the Regional Board adopted two resolutions: Resolution 99-12 and Resolution 99-20. Both of these resolutions established interim cleanup numbers for the two shipyards.

Also, at the March '99 board meeting, the Regional Board directed the executive officer to establish a peer review on using the interim cleanup numbers at the two other shipyards and to follow it up with the workshop. The Regional Board also directed the executive officer to bring this item back to the Board with its discoveries, with its findings.

This next set of slides will discuss the various cleanup level options, and basically these cleanup level options presented in the staff report are derived from these three approaches: background, effects range median and AETs.

On this slide you can see that there are

three reference stations. And in trying to find out what are background numbers, what numbers would be at the shipyards if the shipyards were not there, what we did is we took a look at these three reference stations that are defined in the shipyards' and boatyards' NPDES permit to see what the condition of the sediments are at other locations.

What we did is we tried to find a reference station that would be most similar to the watershed or the contribution of the storm drains at those sites, and we looked at storm water data at the two shipyards, and we did 10 comparisons or 10 chemical concentrations for each shipyard, and we compared those chemical concentrations to each of the reference stations. And then we looked at the ones that were the most similar, and reference station No. 3 had 70 percent compared to the other two references.

And the way we determined that that was the most similar is by doing a statistical analysis to see if there was a statistical difference or a significant difference, I should say, between the two comparisons.

CHAIRMAN BAGLIN: What's "S" and "N"?

MR. RODRIGUEZ: Oh, the "S" means that there was not -- how many comparisons were not significantly different for Southwest Marine, and the "N" is for NASSCO.

So the formulas there shows that for example

reference station No. 1, Southwest Marine had 5 comparisons out of 10 that were not significantly different, and NASSCO had 6 comparisons that were not significantly different. That process was done for each of the three reference stations, and that's how the 70 percent was generated.

DR. DAY: So roughly speaking, the combination of Southwest and NASSCO is 55 percent of the reference station; is that what that's supposed to mean?

MR. RODRIGUEZ: Could you ask your question again?

DR. DAY: I'm trying to understand what the 55 percent --

MR. RODRIGUEZ: 100 percent would mean they're very similar. Zero percent would mean they are very different.

DR. DAY: Thank you.

MR. RODRIGUEZ: So the background numbers listed in the staff report are derived from reference station No. 3 because it's the most similar.

The other cleanup level discussed in the staff report are ERMs, and ERMs are a screening tool. ERMs, it's a national data base that was developed to help give perspective on chemical concentrations when you have no biological data. So when you have that information, you can look at the ERM and it can give you a perspective on whether -- if the concentration is at a level of concern.

This slide shows how an ERM is developed. There are green and red dots plotted on this chart, and each dot represents a study done somewhere in the U.S., and the dot's concentration represents at what level was there an adverse effect in that study.

If you rank the level of concentrations from low to high, and you pick the middle number, that defines the ERM. So 50 percent below the ERM are -- there are significant effects, 50 percent below and 50 percent above, and the way it's shown on this graph is the number of red dots in the green box is equal to the number of red dots in the red box. Like I said, this is an example of how an ERM is developed.

CHAIRMAN BAGLIN: Vicente, on the ERMs, in the information that was provided to us there was some suggestion that this was a scientific analysis, but this system was not necessarily meant to establish cleanup levels.

MR. RODRIGUEZ: That's correct. The ERM is used as a screening tool to help give you perspective on a concentration number when there is no biological data.

One of the reasons why we included it in the staff report is to give you that perspective, and also there is no biological data at the shipyards right now.

This next cleanup level I'll be going into

some detail because you'll be hearing a lot about AETs, and so I'll try to explain what an AET is. I'm also going to try and explain the lowest AET, which you may hear come up with other people speaking, toxicity tests used in deriving that AET, and why even use an AET, why are we proposing the AET that is before you.

This next slide comes out of Campbell's work plan. I have it up here to kind of walk you through how Campbell's AET was developed. The yellow bar up there represents the concentration of range of the 14 stations that were -- the 14 samples at the stations taken at Campbell.

The green dots represent the concentrations at which there was no toxicity observed. The red dots represent where there was toxicity observed. And this next slide will break those sample points out. So, again, the green dots represent where there was no toxicity observed, and the red dots represent where there was toxicity observed.

DR. DAY: Toxicity is defined how?

MR. RODRIGUEZ: Toxicity is defined -- there's different tests that are run to determine what toxicity is. I can go into detail now, or we can wait a few more slides.

DR. DAY: Does it kill animals, or is it just a concentration?

MR. RODRIGUEZ: It kills animals.

The apparent effects threshold is defined by looking at the highest of -- by looking at the highest no observed adverse effect. That's what this green dot here represents. It's the highest of all these other green dots, and that's the point at which an AET is defined.

Above that it's unknown whether there's adverse effects. So that's the apparent effects threshold that's defined as the AET. So if you look at the bar at the bottom where there is the toxicity observed, the two on the left were probably due to something else besides copper. The two on the right were probably due to copper.

The reason that's so is because at these copper concentrations, there was no toxicity observed. That's the process behind an AET. You'll also hear about lowest AET, and this is really how the Campbell's cleanup numbers were developed.

This next graph shows a graphical example. These are not directly from Campbell's numbers. They were just put up there as an example. There are several different tests that are run to generate an AET for each one of those tests. So you'll have tests A, B, C and D, and each one of those will generate a different AET because each test has a different sensitivity.

Then to address the lowest sensitivity, the

lowest AET is selected, and that is the cleanup level that was used at Campbell by selecting the lowest AET of multiple toxicity tests.

And to kind of address some of the questions that Dr. Day just brought up, there's different types of tests for toxicity. There's no probe or meter that you stick in the water or sediment to see if it's toxic or not. You expose sediments to organisms, and then following certain protocols on the number that die or stop growing, you can say there's toxicity or there isn't toxicity.

And these are examples of different types of tests and protocol: polychaete, amphipod, bivalve, echinoderms, microtox, benthic infauna abundance, and these marine organisms that are, like I mentioned, exposed to the sediments, and then that's how toxicity is determined. After you run one of these tests, it's either a green dot or it's a red dot.

DR. DAY: And you get the number from the feds or something like that?

MR. RODRIGUEZ: These particular tests were recommended by the Puget Sound Estuary Program in the State of Washington.

Toxicity tests that are considered in the staff report are pulled from the previous slide: polychaete, amphipod, bivalves and benthic infauna abundance.

So the next question is why use an AET, and to kind of help address this question, I'm going to go ahead and skip on to the next slide before answering it which talks about the Regional Board's legal authority on sediment cleanup levels.

Here's a concept diagram of State Board Resolution No. 92-49. There's a lot of information here, so we'll just focus on two defining lines: the blue background line on the right-hand side and the red beneficial uses line on the left side.

In short, 92-49 says that cleanup levels can not be more stringent than background and cannot cause or threaten to cause a condition of pollution. Pollution is defined as a condition at which beneficial uses are impaired.

We've already defined the blue line earlier when we were talking about reference station No. 3. We're using reference station No. 3 to say this is where the level of concentration for background is at. However, we have not done that for the red line.

There are basically two beneficial uses that will define that red beneficial uses line: one, the marine habitat and, two, human consumption of fish, shellfish or other organisms. First let's focus on human consumption of

fish. The concern here is that contaminants in the sediments will bioaccumulate and biomagnify at higher and higher levels in the organisms that will be harmful to humans.

Based on the information gathered at Campbell Shipyard when their cleanup level was established and the California Toxics Rule, we assume that bioaccumulation will not occur at the shipyards at levels higher than background. However, staff is recommending that bioaccumulation studies be done at the shipyards to confirm this assumption.

The second beneficial use that I mentioned earlier has to do with concern about the protection of marine habitat. Again, based on studies done at Campbell Shipyard, staff believes that this will be the driving force, this will be the beneficial use that will be the driving force for setting up a cleanup level.

So the question is at what concentration is the beneficial use -- at what concentration is the beneficial use for marine habitat impacted? And the answer is we don't know, which leads us back to the previous question as to why AETs.

AETs are a tool to help us find out at what concentration levels impact the marine habitat which, in turn, defines the beneficial use line and that's why AETs

are brought into this picture.

These next slides will look at the options the Regional Board has on staff's recommendations. There are basically two actions the Board can take. One action, the Regional Board can select cleanup levels at the next board meeting. Or since there is no biological data at the shipyards, the Regional Board can direct the shipyards to go back and do a full comprehensive study and select a cleanup level after that study is complete.

If we focus in on each of these individual actions, there are several options available to the Board. The Board can set up cleanup levels somewhere near background which would be the blue background line, or they can set it at the beneficial uses line which I introduced to you as being the AET.

If the Regional Board picks background or somewhere near background, staff recommends that no additional studies would be necessary since there would be an extreme level -- the whole amount of contaminants would be removed and staff would not believe there would be any contaminants left to impact beneficial uses.

However, if the Regional Board picks at the red line at the beneficial uses, and uses the Campbell AETs as the guiding number to set the cleanup levels because there are no biological tests at the site, staff recommends

that there be a pre-sampling program. And then based on the results of the pre-sampling program, the shipyards would dredge.

And, basically, action No. 2 would be a full comprehensive study where the shipyards would not base their dredging on Campbell's AETs, instead they would develop their own AETs independent of Campbell's data.

These next graphs are intended to help you make a decision. They look at the options in a cost curve, in cost versus volume of sediments to be dredged. Now that we've already defined that the cleanup is somewhere between the background line and beneficial uses line, you can see the four options in between this range and the fifth option of no action being outside that range.

At this time, it might also be useful when you're looking at this graph to look at tables 1 and 2 that were included in the staff report. This information, this graph is derived from the tables where you have the volume of sediments to be dredged at the bottom and cost, and you can see where dredging to cleanup levels set at the Campbell or nearest Campbell is somewhere in the $2 million mark for NASSCO. And if it's set at ERMs, it's somewhere around the $8 million mark, and background would be somewhere above the $12 million mark.

DR. DAY: What's the red vertical line?

Page 17

MR. RODRIGUEZ: The red vertical line is the beneficial uses line. In other words, that's the AET line. In this particular instance, it's the Campbell's AET. If you see, this red dot right here represents Campbell's AETS.
MR. MINAN: Excuse me, I have a question. How did you determine the economic cost of obtaining background levels?
MR. RODRIGUEZ: All this data was provided to us by the shipyards. We told them if the Board selected a cleanup level at, let's say, background, how much volume would you be dredging and how much would that cost you.
We asked them that information for all the levels at both NASSCO and Southwest Marine, and they provided us that information, and then we summarized it in the tables for you.
CHAIRMAN BAGLIN: Vicente, a follow-up question to that, did they provide detailed information or just the ultimate numbers?
MR. RODRIGUEZ: Just the ultimate numbers.
This slide is for Southwest Marine; the previous one was for NASSCO. And just due to the size of the facility, NASSCO's background was somewhere over here. So they would be dredging more than Southwest Marine. Southwest Marine is over here because they're a smaller

Page 18

facility.
DR. DAY: Remind me, the AET is without any biological testing, and the ERM is with biological testing?
MR. RODRIGUEZ: No. AETs -- maybe I should back up a little bit. AETs are developed by doing biological testing; however, at the shipyards, Southwest Marine and NASSCO, there has been no biological testing, and instead are relying on biological testing done at a nearby shipyard which would be Campbell.
DR. DAY: But using the chemical composition of those?
MR. RODRIGUEZ: Yes. They have no biological testing, but they have gone out there and taken chemistry sampling. Because there is no biological testing, that's why in the staff report staff recommends that it not be as comprehensive as if they were developing their own AETs, but doing some type of pre-sampling to show that at low levels it's not toxic.
DR. DAY: And ERMs are...
MR. RODRIGUEZ: The ERMs, there is no biological testing. That's why ERMs are used as a tool. ERMs, when you have a chemistry concentration number, but you don't have biological information. You don't know if it's toxic or not. So you need some type of perspective about what does that concentration number mean.

Page 19

This is where ERMs come in. You get an ERM and you look at it, and you compare it to the concentration that you have, and it tells you is it on the high end or is it on the low end compared to the ERM.
Now, once you have biological testing, ERMs aren't -- I don't want to say as important, but they don't carry the same weight because ERM is derived from data at other places in the U.S.
This last slide talks about the practicality of the decisions you'll make, what are the outcomes. If the Regional Board in November selects a cleanup level at background or near background like ERMs, then no additional studies will be necessary and the shipyards can begin immediate dredging.
If the Board selects numbers at the beneficial uses line using the Campbell AET numbers or somewhere near the Campbell AET numbers like 20 percent, then staff recommends that the shipyards do pre-sampling, biological sampling where there will be a limited amount of testing that would not be required for the full comprehensive analysis.
Then the results of that pre-sampling will determine whether -- if the results come back that it is not toxic, then they can begin testing, I mean, begin dredging. If they come back that they are toxic, then

Page 20

additional sampling will be necessary.
And then the third option I have listed is requiring the shipyards to do a full comprehensive analysis to develop their own site-specific AET independent of Campbell's data. Then once the result of that study is complete, we would bring it back before you for you to make a decision on cleanup numbers.
This concludes my presentation. Are there any questions?
CHAIRMAN BAGLIN: I'll ask a question. Vicente, I'm not sure whether it's you or Mr. Richards that might help me out on this. We have just gone through a science class a little bit on this, and we had a brief mention of economics in it. And in some of the information that's been provided to us, it's referring to Water Code Section 13304, as it's stated in one letter that we get, that mandates that when waters are discharged to the state that are pollutants, they have to be cleaned up by the discharger.
And then there is a suggestion that State Board Resolution 92-49 actually requires dischargers to clean up to background levels for the highest water quality which is reasonable. In another letter we had said that it stated that 92-49 states that to insure that the discharger shall have the opportunity to select cost-effective

Page 21

methods.

Is there a clear standard that we're supposed to be listening to? Like, for instance, on 13304, what is the mandate? And on State Board Resolution 92-49, what is the clarification as to what we really should be implementing?

MR. RODRIGUEZ: I should say, a lot of those are summarized in 92-49. 92-49, the intent is to gather and synthesize all the different parts in Porter-Cologne, and be used as a guideline for setting cleanup levels or cleanup standards. I guess cleanup levels is the correct word.

92-49 does say that cleanup levels will be set at background or as close to background as possible based upon -- and I think I put it in your documents quite a few times, and there's a laundry list of things that you need to consider when setting cleanup as levels close to background as possible.

The part about not telling the discharger how to clean up is true, and John Richards can interrupt me if I speak incorrectly. We can tell the shipyards or any discharger that they need to clean up to a certain level, but we can't necessarily tell them that they have to do it using this method or that method.

CHAIRMAN BAGLIN: So I guess I'm still looking for,

Page 22

92-49 says to clean up to background levels or as high as possible. What's the caveat that is linked in there regarding economics?

MR. RICHARDS: Reasonableness.

MR. MINAN: I can read this section to you. It says, "For the best water quality which is reasonable, if background levels of water quality cannot be restored considering all demands being made, and to be made on those waters and the total values involved, beneficial and detrimental, economic and social, tangible and intangible."

MR. PIERSALL: Very clear.

CHAIRMAN BAGLIN: It helps.

MR. RICHARDS: And that helpful guidance comes out of one of the early sections of the Porter-Cologne Act that sort of sets the general state policy in favor of having clean water.

The statute under which you exercise your cleanup and abatement authority gives you the authority to require cleanup of wastes and the abatement of the consequences of discharges of waste which would include pollution and nuisance.

To achieve that, you have got to require cleanup at least to the level that would equal the water quality objectives. So if you had a pollutant that was in the water column, such as acid or a dissolved pollutant of

Page 23

some kind, you would have to at least require that that pollutant was reduced to the water quality objectives which are defined as the levels necessary to sustain the designated beneficial uses.

Here the problem is a little more indirect because you're dealing with a situation where the pollutants are not so much in the water column as in the sediments, and it's their presence in the sediments that affects the water quality in the area and affects the beneficial uses to include the benthic communities and so forth and so on.

If that level of nonpollution is not background, you still have discretion to require that cleanup go beyond the nonpollution level up to and including background. In other words, remove -- you're directed to get the water to be clean. It has to go back to the point at which it's not polluted.

Beyond that, you have the discretion to demand as much cleanup as is reasonable, and that is an interpretation that the state board made in Resolution 92-49. If the discharger cannot achieve a cleanup to the nonpolluted level, then the pollution persists.

CHAIRMAN BAGLIN: What's the comparison and meaning of reasonable and maximum extent practicable, since that's

Page 24

a term that we also face very often?

MR. RICHARDS: It's the terms that allow you to exercise a certain amount of subjective judgment. In determining what is reasonable, you would look at all of the factors that Mr. Minan mentioned, economic considerations, the cost of cleanup, the incremental level of either water quality or sediment condition, improvement per dollar spent on achieving it. You would look at the significance of the beneficial use, all these considerations.

And the maximum extent practicable is essentially the same kind of analysis that you would have to do. It requires you to again balance all of these considerations and achieve the greatest amount of cleanup and the greatest restoration of background conditions that is practicable. And that depends on the available technology, and it depends on the extent of the pollution and so forth.

CHAIRMAN BAGLIN: There seems to be some presence of evidence that the sediment in the areas that we're talking about is not satisfactory for beneficial use, that it is toxic. That perhaps is rather tangible.

As we're making any determination on the other factors included, such as economic, if we are to be pursuaded that there is an economic argument, can we also ask to have the specificity with that that we do, for instance, for the biological? And that is just not someone stating that this is not reasonable, this is not practicable, but here is the evidence that shows income, outflow, expenses, profit...

MR. RICHARDS: Absolutely. You can delve into that to the maximum extent possible. In fact, you should before you make a determination that something is infeasible or not practicable. You should certainly look at more than a bald assertion that this is going to cost a lot.

CHAIRMAN BAGLIN: Any more questions?

MR. PIERSALL: John, if it turns out that it is practicable to clean up to, say, background levels and that there's no evidence that the shipyards in question, whichever one it would be, can't afford to clean it up, does that kind of preclude us from doing anything except background levels?

MR. RICHARDS: Let me understand your question correctly. You're saying that it would be determined that the Board would find that it is practicable to achieve background cleanup, and that there is no evidence that it would be impracticable for the shipyards to achieve that?

MR. PIERSALL: That it would be cost prohibitive, yeah.

MR. RICHARDS: Then according to the terms of

92-49, you would be obligated to require cleanup to background.

MR. MINAN: Let me ask, I think, a follow-up to Frank's question, or it may be Frank's question again in a slightly different guise. And that is if we were to establish background levels for NASSCO, say, what precedential value would that determination have on all of the other shipyards in the bay? Would we be required similarly to treat any other shipyard in the bay according to the standard of background levels?

MR. RICHARDS: Yeah, it would certainly establish a precedent that for that cleanup, background cleanup was practicable, yes. It would establish a precedent that that was an appropriate level of cleanup.

MR. PIERSALL: Then each case you would also have to look at it and say, is it economically feasible or...

MR. RICHARDS: That's true. Practicability might be affected by site-specific conditions.

MR. PIERSALL: It wouldn't necessarily, say, set a precedent to say, okay, we set the background level for these because we know they can afford to do it, so everybody in the bay has to live by that. As opposed to saying, okay, background level is the desired result, but this guy for other reasons, whatever, can't afford it, it's not economically feasible, and then if he can do it,

he can clean up to this level. Is that...

MR. RICHARDS: That would be correct, yes, provided that you achieve a cleanup that goes at least to the point where the pollution has been abated, wherever you set that level, where the beneficial uses are not being -- the quality of the water is necessary to sustain the beneficial uses not being impaired.

MR. PIERSALL: Beneficial use nonimpairment would be below the highest level.

MR. RICHARDS: That's right. That would be the threshold of pollution, if you will.

MS. BLACK: If you take a look, as you go through the history -- and Campbell was decided back in '95 -- to the cleanup and abatement order to basically Option 4, they're all kind of clustered together. What would be the incontinuity of deciding one level for shipyards, but then four and a half years ago it was decided another level within the bay? Do you see what I'm saying? Campbell is one level, but potentially you have...

MR. RODRIGUEZ: I think that's where your discretion comes in because you do have that range to pick from.

DR. DAY: Following up on that, have we set levels for the Campbell shipyard?

MR. RODRIGUEZ: Yes.

MS. BLACK: Yes, it's in Option 4.

DR. DAY: Campbell is where they're going to build a hotel that's going to support the ballpark; is that the one? That's the shipyard?

MR. RODRIGUEZ: The one next to the convention center.

DR. DAY: And did we do that on the basis of biological tests or just on the chemistry?

MR. RODRIGUEZ: No, it was quite a bit of biological testing, that third option I showed on the last slide where they did a full and comprehensive analysis. And then based on that, we brought it before the Board, maybe some of you, I don't think all of you, and the Board decided to set the cleanup level at that AET.

DR. DAY: So assuming Ms. Black's point, at least logically, in order to avoid full employment for lawyers, it would be sensible to start out at least at the same Campbell level. And then if we find evidence to change it up, we might change Campbell as well. But at least they're all linked together, if that makes some sense.

MR. RODRIGUEZ: It did make sense.

DR. DAY: It depends on who your lawyer is.

MR. PIERSALL: I don't think that the level we set for Campbell sets a hard precedence, if I'm correct. Is that right, John?

MR. RICHARDS: That's correct. It was based on a site-specific establishment of the AET levels, but the Board retains the continuing jurisdiction to reassess the adequacy of those levels and the adequacy of the level of cleanup under the principles of 92-49.

MR. PIERSALL: Just a question here, if we decided that we made a mistake on Campbell cleanup, can we go back and revisit that and say you got to clean it up to background levels or to another level?

MR. RICHARDS: Yes.

MR. PIERSALL: That's not on the Board right now. That's just a question. I'm trying to find out our parameters.

CHAIRMAN BAGLIN: Any more questions right now?

MR. RODRIGUEZ: I would just like to add another clarifying point. When the Campbell numbers were developed and selected as the cleanup level, it was made clear in the cleanup and abatement order and to the Board that the cleanup numbers derived at Campbell was designed for Campbell, and --

MR. PIERSALL: Site specific.

MR. RODRIGUEZ: Yes. And the intention was not to set a precedent for using those numbers at other shipyards. What's happening now is there is no biological data at these other shipyards, and instead of looking at a blank

wall, we're looking at Campbell shipyards to get an idea at these other shipyards.

DR. DAY: I realize Campbell is not before us, but since we set levels for Campbell back then, have we done continued testing or monitoring at Campbell?

MR. RODRIGUEZ: There has been monitoring under their NPDES program, but not for biological. There has been no biological testing.

DR. DAY: And they've been cleaning up.

MR. RODRIGUEZ: No. They are currently in violation of their cleanup and abatement order, and the executive officer issued a notice of violation, I believe it was in August.

DR. DAY: I see. I'm only trying to remember, they're not cleaning up because they're not sure it's final or something like that? Why aren't they cleaning up?

MR. RODRIGUEZ: We have not gotten an official response from Campbell why they have not cleaned up. They are working on their response. It has been complicated a bit because the port is now actively involved in the cleanup at Campbell, and so we're told that the response to the notice of violation is being worked together with the port.

DR. DAY: Maybe we should do some more testing of

biological over there and change their levels.

MR. PIERSALL: That's possible. I think part of the problem is they had enough financing for that hotel that they were supposed to build there, so they're not doing anything. I think that probably has a lot to do with it.

CHAIRMAN BAGLIN: Now we have another subject emerging. Do you have anything else, Vicente?

MR. RODRIGUEZ: No.

CHAIRMAN BAGLIN: I have speaker slips from 12 individuals who would like to comment on this before us. I'm sure, as you all know, we're sent quite a package ahead of time that we've got a lot of information on. It would be very helpful to us if you would be very specific about what you support or do not support. And, also, do not feel inclined that you have to get comfortable at the microphone and spend your entire five minutes there.

What I'd like to do is give the first opportunity to speaking to NASSCO and Southwest Marine, if you'd care to take advantage of that. Mr. Hartnett, NASSCO?

MR. CHEE: Chairman Baglin, Mr. Hartnett does not represent NASSCO. Mr. Chee is speaking on behalf of NASSCO.

CHAIRMAN BAGLIN: Oh, excuse me.

MICHAEL CHEE,

MR. CHEE: Excuse me, I was just trying to clarify where the controller was for the presentation. Good afternoon, my name is Mike Chee. I'm the environmental manager at NASSCO. We're located at Harbor Drive and 28th Street as you've seen on the maps before you today.

We would like to thank you for the opportunity to speak today. Obviously this is a very important issue for all of us. The next slide that you'll see is a recap of staff's slides where they're pointing out the specific options that have been proposed within the packets that you've been presented.

In addition to those options, I'd like to just make a couple of specific comments on those options and a couple of comments on the biological testing that we are proposing and that you have before you.

In addition, the additional biological testing that we're proposing or the toxicity testing, it will be conducted on several transects that are extending out from the remediation area. That is, on lines that extend out from the remediation area, numerous samples will be taken and analyzed, and those will be extending out from the existing remediation area.

What we would then do is propose to evaluate the test results of those and determine if the remediation boundary is statistically different from the reference station within the bay. Because of the additional samples that are being taken, the remediation area can be expanded if required to make sure that we demonstrate protection of beneficial uses and water quality. Additionally, the toxicity tests will provide other benefits as we establish a cleanup standard that's protective of San Diego Bay.

The biological data will support the establishment of cleanup levels that do, in fact, protect the beneficial uses and water quality, rather than choosing an arbitrary chemical value. The testing will also address the peer review comments that were raised concerning the Campbell AETs and the transferring of those AETs to the shipyards. The testing also uses a toxicity standard that has been validated in other areas of the country.

Additionally, the testing is designed to achieve the required level of environmental protection without incurring additional delays or unnecessary costs. Determining the appropriate remediation level through this biological testing is consistent with the prior practices the Board has used in setting cleanup standards.

Campbell AET approach, when you add to this approach the biological testing that we're proposing, you have in our opinion the most timely and the most cost-effective method to achieve this protection of

beneficial uses. The additional testing program is a comprehensive test program, so that if the initial analysis does not confirm the selected cleanup levels will protect beneficial uses, the outer testing area, as I said, will be expanded until we reach a satisfactory result.

Option 3 represents an extrapolation from the AET values that have been determined by the Board. What this option does is it has the benefit of being more timely than Option 5 and more cost effective than Option 1 and 2.

The additional testing that will be conducted on top of the safety factor is really a belts-and-suspenders-type of approach. It adds the safety factor or the cushion that staff has referred to within their report to this approach.

As far as a site-specific AET, no evidence has been presented or is available to indicate that the results from this option would be more reliable as an indicator of protection of beneficial uses and water quality than with Option 4. It represents an unnecessary additional cost to reach the same conclusion that can be supported by the proposed testing. The cost of this study alone could begin to approach the cost of the ultimate remediation.

ERMs, as staff has pointed out, are from a

data base that was developed by NOAA from various sites throughout the United States. They were developed without regard for actual conditions in San Diego Bay, and, more importantly, NOAA advises that ERMs are not intended as cleanup or remediation targets, and also cautions that ERMs are not necessarily predictive of toxicity thresholds.

As far as Option 1, the Board has determined cleanup levels that are required to protect beneficial uses at various times in the past and at various locations, but never at background.

The Board has tailored cleanup to the specific site circumstances. Few examples, Paco terminals, copper was set at 1,000; Shelter Island, 530. Campbell as we've heard is at 810. And at Convair Lagoon, dredging didn't take place. A cap was placed over the contamination site.

We believe that cleanup to background is not legally required, and, more importantly, the key goal is the protection of the beneficial uses and the water quality.

This is a chart that you've seen before from staff obviously. I think it is a very effective chart. It shows that the risk of pollutants remaining decrease as you move more towards the background level. It also shows that the risk of sediment degradation increases as you move more

toward the AET level.

What's not addressed on this chart is toxicity, in other words, the actual biological effects that you would see if there was any pollutant remaining in the sediment.

CHAIRMAN BAGLIN: Mr. Chee, you have gone to six minutes already, and I know you gave us a letter on October 4th that had quite a bit in there. Could you please draw your remarks to a conclusion.

MR. CHEE: This is the last chart, thank you. If you add another arrow onto this chart, starting with the "no action," toxicity would tend to decrease as you move up the graph.

Option 4 with the additional biological testing that are proposed will determine at what point as you move up on that graph that no additional biological effects are observed. If you go beyond that point, as staff has pointed out, there may be, in fact, environmental harm that's caused.

To go further up the graph is wasting effort, and it's wasting money without any additional environmental benefit. That is what I meant earlier when I referred to cost-effective cleanup.

We believe that with approval of additional testing and the work plan, we can start the program within three weeks. We've already submitted all dredging applications to the appropriate agencies, and we continue to voluntarily work with staff and with the Board to try to implement a plan that will protect beneficial uses and water quality.

We would recommend that the Board adopt Option 4 and authorize us to do the additional toxicity testing. Thank you.

CHAIRMAN BAGLIN: Mr. Minan has a question.

MR. MINAN: Actually, I have a couple of questions. I'm trying to get an assessment of the economic impact of the background cleanup, and there are three areas that I don't know whether you're the right person to answer this or maybe one of your staff or colleagues here today would be able to help me figure out the economic consequences.

First, on your building contracts, do you have an environmental remediation pass-through provision so that some costs that might be related to remediation would be passed through to a contractee with you?

MR. CHEE: I'm really not the right person to be asking that question.

MR. MINAN: Is there somebody who could answer that from your group? I'd also like to know if you've ever made a claim under any contract for remediation cleanup costs with any of your contractees.

MR. SACKETT: Richard Sackett on behalf of National Steel & Ship Building. Mr. Minan, I don't have the answers. What I wanted to promise you is that we do have -- I believe the comment period has been extended for a full week, and I'm writing your questions down. I'll be glad to respond to those in writing and give you the full answer to those.

MR. MINAN: I appreciate that. There are a couple other questions that I have also.

MR. SACKETT: I'm going resume my seat and write them down, thank you.

MR. MINAN: The second area that I'm interested in trying to assess the economic impact to not only you but to any of the other shipyards in this area, is to what extent do you expense as an ordinary business expense, any remediation costs that you might incur with regards to a project like this, or capitalize those costs, or take advantage of Section 198 of the Internal Revenue Code provisions, which I alert you are due to expire at the end of this year. So how you deal with these costs as a practical matter certainly would influence my thinking on the issue.

MR. SACKETT: I do have somewhat of a reply, although it's certainly different. And I think I would beg to differ --

CHAIRMAN BAGLIN: Your name again, sir.

MR. SACKETT: I'm sorry. This is Richard Sackett again with NASSCO.

I beg to differ somewhat with Attorney Richards' characterization of the cost issue and the cost analysis. We believe that under 92-49 and the code, the issue of cost is not an absolute cost. It isn't whether we can afford to do it or not.

The question is what's the most effective use of funds in order to achieve the required environmental benefit. Whereas, if I can achieve the environmental benefit for X dollars, I'm not required to spend X-plus dollars to achieve more that isn't required by law to restore beneficial uses.

The key is what do we have to do to restore beneficial uses, and we propose a program that we think will address whether or not beneficial uses are, in fact, being harmed. There's testing that's going to be done, and that will answer that question.

MR. MINAN: I appreciate your position. It would be interesting to me to know how you deal with the remediation costs.

MR. SACKETT: We'll still do that for you.

MR. MINAN: There's just one other line of inquiry that I have of an economic nature, and that is to what

extent do your environmental liability insurance provisions permit you to make a claim against your insurance companies that would, in fact, bear all or a significant portion of the cost of any remediation, because obviously that would affect significantly the analysis with regards to certainly background levels, not so much with regards to what you are proposing.

So those are three areas in the realm of economics that would be interesting to me.

MR. SACKETT: Got the questions, thank you.

MR. PIERSALL: I have a question. Anybody here to answer it?

It seems to me that for about the past 40 years you guys have been throwing pollutants in our bay, and my question is why you shouldn't be responsible for cleaning up those pollutants that you put in there, period.

MR. CHEE: Couple of thoughts on that. I mean, we heard in the earlier presentations today about the whole issue, nonpoint source runoff from the entire community in this area. And while NASSCO obviously has had storm water discharges from our facility, there has been throughout the entire watershed area, a lot of discharges that would be considered contaminated stormwater.

And I think without the controls being in place that you could isolate, I think that is a very

difficult statement to make, that NASSCO has or any other entity, whether it's a shipyard or not, has been discharging continuously for a 40-year time period.
MR. PIERSALL: I don't think there's any question that they have been. Now, how much they have in addition to the storm drain problems, I'm not really sure. But I think the studies that have been made in that area pretty well point to the shipyards being a major discharger in there.
CHAIRMAN BAGLIN: Any other questions for Mr. Chee?
DR. DAY: First, why do you suggest that your area or your levels should be set just by your own footprint rather than by background No. 3, or background No. 2, or background No. 1?
MR. CHEE: Mr. Day, what we were trying to get to the point of is that there is a point where instead of just looking at chemical values, you need to look at the biological effects that are occurring out in the bay, are you, in fact, causing harmful impact to the bay, are you affecting the beneficial uses, are you affecting the water quality.
And without doing toxicity testing, we don't believe that you can answer that question by just looking at chemical values whether they're at our site or other sites for a reference. The toxicity testing is a key

component that is currently missing.
DR. DAY: Perhaps I misunderstood your presentation, but I thought you were disputing the choice of the staff to pick as a comparison station No. 3, and you wanted a station within your own area.
MR. CHEE: I don't believe that was part of the presentation. Are you referring to part of the material that we had submitted to you?
DR. DAY: No. On the slides.
MR. CHEE: We didn't argue with the reference station.
DR. DAY: I see, okay. I think I also heard, perhaps again mistakenly, that doing additional bioassays or testing would cost almost as much as the benefits or something to that effect. What was that statement?
MR. CHEE: It was the statement that as you -- if you go in now and do -- build on the work that has been done throughout the bay and do biological testing based on that, you have a certain expense associated with that.
If you now go in to developing a site-specific AET, you're in essence ignoring all existing data and starting again from scratch. So your cost jumps considerably, but you end up at the same point. So you end up with the same answer as to what level do you need to

clean up to to protect beneficial uses and water quality, and that was the point that I was trying to make on the difference between a site AET.
DR. DAY: Well, I still don't understand, but I'll think about it.
MR. RICHARDS: Mr. Chairman, I'd like to ask Mr. Chee a question. If I'm not mistaken, what you're proposing to do is achieve a cleanup that will be not significantly different in terms of toxicity and impact on beneficial uses than what exists in the bay at large.
MR. CHEE: Correct.
MR. RICHARDS: Which is to say background.
MR. CHEE: Correct.
MR. RICHARDS: So you are proposing that NASSCO would clean up to what amounts to background, not necessarily in terms of chemical concentrations, but in terms of toxicity, impacts on the environment, diversity of the community, et cetera, et cetera, et cetera.
MR. CHEE: That is the key point that we don't want to be just assuming a cleanup standard, but determine the difference between our site and the reference stations from a toxicity standpoint, a biological effects standpoint, that there is no difference --
MR. RICHARDS: So you'd be saying that background might differ in terms of concentrations from reference

station 3, but that the outcome of your cleanup would be a restoration of the level of beneficial uses, the biologic diversity, the health of the community that would be tantamount to background?
MR. CHEE: Yes, it would.
MR. PIERSALL: I have a question on that. Maybe I didn't understand the connotation of "background." My definition of "background" would be clean up to the point where if the shipyards had never been there, what would the background be there.
In other words, not to go to some point in the bay and say, okay, we'll clean up to this level. Now, that whole cotton-pickin bay is pretty polluted. I wouldn't eat a fish out of there, or I wouldn't swim in there at all, anywhere in the bay. And I wouldn't want the cleanup just to keep it at that level.
I mean, we got to start somewhere to clean up that bay. If we just clean it up to the level, to the highest level it is right now, we'll never get it cleaned.
MR. RICHARDS: I think there is certainly a range of conditions that might be deemed background. The background conditions that are addressed in the technical report that you've got do not reflect pristine background conditions of San Diego Bay before urban development and industrial development.

I think you have to make a judgment about what level of background environmental quality, what level you're going to set to represent background water quality and background environmental quality.

DR. DAY: Doesn't Porter-Cologne refer to background as what exists now?

MR. RICHARDS: Porter-Cologne doesn't really refer to background.

DR. DAY: There's some statements I remember where --

MR. RICHARDS: In Section 13304 it simply says that you have the authority to require that waste that has been discharged be cleaned up, and the presumption of that language is that all of the waste that was discharged should be cleaned up.

It also says that you have the authority to require abatement of conditions of pollution and nuisance associated with that discharge. Porter-Cologne does not define what "background" is, and it leaves it up to you as a board. You as a board establish the minimum levels at which pollution -- the pollution threshold which is where water quality objectives are, and that establishes the water quality that's necessary to sustain the beneficial uses that you've identified.

And then the state board's

anti-degradation policy says that where water quality is better than it needs to be in order to sustain the beneficial uses, in other words where it's better than the water quality objectives, you should not allow degradation of water quality below that background level, which is to say -- but that is the existing background level at some point in time, and certainly background levels vary over time.

But you have to make a policy judgment about which background level you're going to deal with in setting something like a background level as the basis for a cleanup.

DR. DAY: If I understand the thrust of Mr. Piersall's question, it wouldn't seem to me to be reasonable to expect that we would define background to be something that we could somehow extrapolate backwards in time to be before the Porter-Cologne Act.

MR. PIERSALL: As I stated a while ago, I wouldn't want to say, okay, are we going to take a point somewhere in that bay and say that's the background when the bay is polluted. And I don't think we can -- we probably had a hard time finding a place in that bay to take a sample that would even qualify for the beneficial uses.

MR. RICHARDS: This discussion all is premised on

the presumption that background is better than it needs to be in order to sustain the beneficial uses.

MR. PIERSALL: I don't think that's true.

MR. RICHARDS: If that is not true and background is polluted, then this discussion becomes meaningless, and the only acceptable cleanup level is cleanup to the threshold of pollution or beyond, but the issue of background becomes mute. You certainly could not set a cleanup level below the threshold of pollution.

CHAIRMAN BAGLIN: May I jump in? I think that we're learning a lot through this process. A key thing for everyone to remember is we have another hour of testimony to come before us, so we might want to save some of our ideas and so on at the end, and we can do it especially if we're giving opinions. Hold that, and let's listen to the testimony and move ahead if we can.

THE REPORTER: Mr. Baglin, can we take five minutes before we go on to the rest?

CHAIRMAN BAGLIN: If we can reconvene at 3:20.

(Whereupon, a brief recess was taken.)

CHAIRMAN BAGLIN: Good afternoon. If we can reconvene the meeting at this point in time, and I am trying to allow those who are representing the shipyards to come up first. Mr. Hartnett, are you representing -- I see here now it's the unions of NASSCO employees, so

you're invited to make your comments.

CHRIS HARTNETT,

MR. HARTNETT: Good afternoon, my name is Chris Hartnett. I'm a representative of the United Waterfront Council that has six unions and the craft workers that work there at NASSCO every day, approximately 2,000 people.

I don't know anything about AETs and ERMs. I do know about the environment that these 2,000 people have to put up with every day. As a ship is completed and put into the water, these people work in an open-bottom dinghy, and they are subject to the spray that comes off of the ocean.

For instance, today when the wind is blowing, they end up ingesting some of that water that comes off of the ocean. They put up with the environment that NASSCO has them work in every day, and it's not a healthy environment.

They don't know anything about AETs and ERMs. All they know is they go to work every day, and they put up with this environment. And we would hope that you would take heed to the fact and request that -- and keep NASSCO's feet to the fire, and bring the bay back to something that is a plausible working condition for these people to work under every day, whereas now it's not. And

I thank you very much.

CHAIRMAN BAGLIN: Thank you, sir. I believe there are three representatives from Southwest Marine who wish to talk. First I have Shaun Halvax?

SHAUN HALVAX,

MR. HALVAX: Yes, thank you very much. Thank you Mr. Chairman, members of the Board, my name is Shaun Halvax, and I manage environmental affairs for Southwest Marine. My presentation today is not going to take more than 10 or 12 minutes.

CHAIRMAN BAGLIN: 10 or 12 minutes? Is that all three of you combined?

MR. HALVAX: Yes.

CHAIRMAN BAGLIN: We have five minutes per person.

MR. HALVAX: Yes, yes, five minutes per person.

Southwest Marine recognizes its responsibility to the sediment quality within the leasehold since its tenancy at the facility which has been about 20 years. Southwest Marine is looking forward to this board resolving and establishing cleanup standards for the shipyard.

We believe your staff has done a very good job in identifying, assessing and illustrating the data that has been accumulated to date on the other sites as

well as Southwest Marine.

There is a significant amount of chemistry-related data at Southwest Marine. I think somebody spoke here earlier about the fact that additional biological assessment is being contemplated to coordinate that chemistry to look at exactly what's going on in the sediments at Southwest Marine.

We would like to briefly overview some points that talk to and are related to the alternatives and the options being presented, and I would also like to briefly discuss the costs. Southwest Marine has provided costs to your staff to look at how each option is derived within those costs.

There are several factors, as you can see by tables 1 and 2. And generally speaking, for Southwest Marine, the ERM is approximately three feet of dredging throughout the shipyard. The ERM and background are very similar at Southwest Marine because we're a relatively small facility.

And then the other end of that, the Campbell AET would be approximately four and a half feet of dredging within a particular isopleth that is in the dredging plan that's been designed.

With that, I'd like to introduce Ms. Lucinda Jacobs from Exponent Environmental Group who's going to

summarize some of these points that we'd just like to bring to your attention, and then concluding remarks by Mr. Dave Mulliken to finish our presentation. Thank you very much.

LUCINDA JACOBS,

MS. JACOBS: Thank you. We very much appreciate the opportunity to provide comments, and we also understand and appreciate the desire of the regulators and the community to protect and improve the beneficial uses of San Diego Bay.

We've been working with the shipyards for several years now and with the staff to develop sediment cleanup approaches for sediments in the bay that are based on sound scientific principles. We agree wholeheartedly with the staff perspective on Options 1 and 2.

The cons for these options far outweigh the benefits, or the cons outweigh the pros. There's no scientific support for either of these options, and no other rational scientific conclusion could be reached. However, we also agree with the staff on Option 6. That is that no action is not appropriate for the bay.

We believe that refinement of the approaches embodied in Options 4 and 5 is the appropriate approach to take. These approaches integrate site-specific chemical and biological data to identify no effects cleanup levels

for the sediments.

The refinements that we offer to these two options address issues with the proposed testing program. There's a wide range of biological tests of varying degrees of ecological relevance that are available. The requirement of the proposed requirement for four different biological tests with nine different assessment endpoints is unprecedented for any environmental investigation of sediments.

Instead we believe that for sites like the shipyards, which have a limited set of chemicals with a limited potential to bioaccumulate, it's important to factor in ecological relevance of these different biological tests. For example, the larval tests that are proposed are generally less ecologically relevant than some of the other tests, primarily because the larvae that are used in these tests do not live in or on the sediments.

In contrast, the direct measurement of the life forms that live in and on the sediments is of the highest ecological relevance and is also a direct measurement of the most sensitive beneficial use as defined by the staff. These are the types of issues that we think need to be considered in refining the testing programs identified in Options 4 and 5.

We also think that refinements to Options 4 and 5 are preferred over Option 3 with its 20 percent safety factor primarily because they're based on some very sound scientific principles rather than an arbitrary safety factor.

I think in the overall cleanup it's also important to remember that the act of dredging sediments has adverse effects that need to be considered as noted by the staff in their report.

And, finally, for both the site characterization and site cleanup, it's important to balance the net environmental benefits against the costs, and that's been alluded to several times so far.

We will be addressing these issues in greater detail in our written comments and encourage you to seriously consider these views on these technical issues. Thank you.

CHAIRMAN BAGLIN: Thank you.

DAVE MULLIKEN,

MR. MULLIKEN: Chairman, I'm not sure I can do much to get these microphones any closer to me. I'm too tall. I'll just speak up.

Thank you for taking the time to hear from the representatives of Southwest Marine today. I think that the message here is that obviously everyone involved

in this in the first instance should be applauded for their extensive efforts that's been devoted to this. And I should say perhaps not only the effort that's been devoted to it, but the endurance shown by everyone involved in this. This issue has been before the Board for an extensive period of time.

Whatever decision the Board makes ultimately has to be grounded on good science. But in this context, I submit to you that good science and cost effectiveness or the cost-effective approach are one and the same.

Mr. Richards correctly reminded you that the operative sections of the Porter-Cologne water code that drive this say nothing sufficiently specific to constrain your decision and tell you what is the correct answer in black and white terms.

Indeed I submit that this entire issue is something that falls into a gray area. When the Porter-Cologne statute was enacted and Section 13304 cleanup and abatement order provision was incorporated into this statute, it envisioned abating discharges to water. It didn't really contemplate, if you will, in the first instance the remediation of sediments. We're dealing with a sediment remediation here as opposed to a direct discharge to water which is more or less, if you will, the natural and more traditional focus of Section 13304.

And I think the reason it's helpful to keep that in mind is because that slight significant difference really implicates a larger body of law, as Mr. Richards correctly alluded to nuisance concepts. Indeed if we were looking for a legislative framework that was on this kind of problem, probably the closest thing I would say would be the Federal Superfund Law, not really the Water Code or the Federal Clean Water Act.

And I say that for the very reason that the Federal Superfund Law does contemplate remediation of environmental problems that is appropriately environmentally protective, but in every instance is cost effective.

And I forgot which of the board members asked about this question, the issue of cost effectiveness is not simply a black and white issue. It can be effected or regulated on affordiveness or not afforded; that's not the issue. The issue is what is cost effective and necessary to achieve the environmentally protected result.

That is the result that Exponent has studied extensively and is recommending here which is, if you will, a suite of testing, biological testing as contrasted to chemistry testing in order to be able to intelligently determine what is the environmentally beneficial result

that is the result that will be consistent with protecting beneficial uses.

I think it is important for us to bear in mind that in understanding what those beneficial uses are, that the activities we're dealing with are shipyards, and none of the operative planning documents contemplate eliminating shipyards from the face of San Diego Bay.

The goal here is to achieve what is environmentally beneficial to protect beneficial uses of the water and to do so cost effectively. I think the direction the staff seems to be going will accomplish that result, and I understand this is a complex topic, but I think ultimately it's one that is susceptible from being resolved in an appropriate manner.

We were determined to stick to our time limits here, and so I thought I could perhaps at least in part take a crack at answering some of the questions that Mr. Piersall and Mr. Minan had addressed to the NASSCO representatives. But to make sure I didn't miss the opportunity, I did want to make two quick comments, if you will, on process issues.

You're still in the evidentiary accumulation process, if you will. The comment period will remain open here for another several days. The staff obviously is challenged with digesting a lot of material here. I find it somewhat unusual that as we proceed to a decision, you're doing so without the benefit of the staff recommending what they think is the right answer.

Now, I understand in fairness they're trying to lay out the array of options and do the very best job they can in analyzing the pros and cons in each of those, and I think that's very useful. But as the evidentiary accumulation process comes to an end, it seems to me it may be useful that as you deliberate this issue in November, that you have the benefit of the staff recommendation.

A second point that I would say, and I will make it clear on this issue that we simply speak for Southwest Marine, but when you have enacted a resolution, whatever that may be in Southwest Marine's case, at least it's our view that that should then be followed by a cleanup and abatement order. I believe that the statutory underpinning, if you will, is Section 13304, and that would be the appropriate thing to do.

Again, I want to make sure we didn't run over our time. If it's appropriate or if the Board wishes, I would be happy to take a crack at a couple of questions that perhaps were not fully answered in the previous --

CHAIRMAN BAGLIN: Since the time limit has been extended for written materials to come in, I think we prefer that you probably address them in those materials.

MR. MULLIKEN: Okay. Thank you very much.

CHAIRMAN BAGLIN: The next three speakers: Nicole Capretz, Cara Franke and Jim Peugh.

NICOLE CAPRETZ,

MS. CAPRETZ: Good afternoon, I'll pass this out real quick. As I was thinking about what I was going to say -- oh, my name is Nicole Capretz with the Environmental Health Coalition.

CHAIRMAN BAGLIN: Can you also describe what's being passed out.

MS. CAPRETZ: Oh, sure. This is a very rudimentary graph of my understanding of the issue that will hopefully clarify our position and why we hold the position we do. I don't know if that will accomplish what I'm hoping it will, but maybe it will.

So, like I said, last night as I was trying to determine how I was going to approach speaking about this issue, I wanted to try to distill the issue as much as possible, try to clarify and simplify what the bottom line is.

CHAIRMAN BAGLIN: Sorry to interrupt, but since you passed these out, Art has additional copies and if anyone who is a party to this wishes to see a copy of what was passed out, you can get one.

MS. CAPRETZ: That's fine, if they can understand it. Now I lost my place.

So the basic bottom line for us is that we have a very simple premise here. The shipyards have illegally discharged pollutants into San Diego Bay, and it is their responsibility to clean them all up. I think Frank Piersall articulated it best by saying just that, and that is the bottom line point.

So what I want to do with this graph is sort of show you the universe of what we're talking about. What we have -- unfortunately my numbers are wrong because of the recent staff report that I received -- is we have a total for NASSCO of 131,281 cubic yards of contaminated sediment. That's the entire universe of contaminated sediment.

So the first question for you is so what do we do with all this contaminated sediment? Well, first obviously like you guys have been discussing, you look at the law, what does the law say. Contrary or maybe consistent with John Richards, we believe the law is very simple and straightforward. You must clean up to background unless background levels cannot be restored, "unless" not "or."

You cannot clean to backgrounds or a lower level of water quality. You must clean to background

unless water quality -- unless background levels cannot be restored. And the way to determine if background levels cannot be restored is to look at the economic and technological feasibility.

We've seen no analysis done for this threshold question, and so for us it's imperative that this initial question be answered before we even consider adopting cleanup levels that are lower than background.

But just for argument sake because staff seems to be going along with the legal interpretation that the legal standard is protecting beneficial uses, I'd just like to draw your attention to the chart. And what we have obviously is showing all the contaminated sediment. On the left-hand corner you see the AET values.

This is the level at which the shipyards would like to clean up. This means that only -- and my numbers again are wrong, and I clarified them with the staff report -- only 9 percent of the contaminated sediment would be removed. This is providing the bare level, the bare minimum level of protection for beneficial uses of San Diego Bay.

The AET levels are at the edge of destruction. If the shipyards add any level of a contaminant onto the sediments at that level, they will become acutely toxic. They will be killing marine life.

Page 61

There's no safety factor involved at the AET. So they're not appropriate for cleanup levels.

Then you look at the AET, plus the staff has proposed a 20 percent safety factor. Well, then -- again, my numbers are wrong -- you're only going to be removing 13 percent of contaminated sediment. So what about the rest of the contaminated sediment? What's going to happen to the marine life that's still being exposed to elevated pollutant levels in the sediment?

We don't know. Science doesn't really answer that question for us. Science gives us tools to help us predict what might happen, but certainly we don't know. All we do know is that there's still going to be elevated levels of pollutants in San Diego Bay. That's not acceptable.

The only analogy I can think of in thinking about this is if there's a patient who has a malignant tumor in their body and the doctor says, well, I've spoken to the HMO and we decided that we're going to remove 9 percent of your malignant tumor because that's the most cost-effective thing we can do.

We feel that doing the risk benefit analysis, that removing 9 percent will insure that you won't die tomorrow, but it will also insure that we'll be able to spend the least amount of money. Well, this is

Page 62

shocking. No one would ever accept that as an acceptable solution for threatening the life of a human.

Look at it in relation to marine life. What you're saying is that if you use the AET value and you only remove 9 percent of the sediment, then you are still risking the life of all the marine life in San Diego Bay. Well, we find that a morally bankrupt position and not tenable and certainly not supported by law or the ultimate goals of the Clean Water Act.

Then you look at ERM levels. They're getting much higher up on the confidence level. Again, what these levels are really telling you -- they don't tell you a certainty of how much toxicity they're going to be removing from the bay, but they give you a predicted level.

So the ERMs -- and I have here that they would remove 95 percent of contaminated sediment. In reality the new chart tells me that it would remove 61 percent. But certainly we're getting to a more protected level.

Background is the only level at which we can be truly confident they're removing all of the pollution from San Diego Bay. This is a bay that you guys have already said is highly toxic, is not supporting beneficial uses of swimming and fishing.

We don't want to leave the legacy behind of

Page 63

not taking the opportunity to remove as much pollution as we can. And, again, it is definitely feasible to remove all the pollution in this circumstance. It is definitely technologically and economically feasible to restore the sediment levels to background, and it's imperative that you do that.

And going to the cost issue because that seems to be an issue of concern, in our opinion the only cost to consider is the price San Diego Bay and the marine life have had to pay from the onslaught of toxic chemicals that they've been exposed to.

In addition, let's not forget too that the public has been subsidizing the use and, I would say, the abuse of San Diego Bay by the shipyards. Because the shipyards have not once -- and for NASSCO's case 40 years or Southwest Marine's case 20 years -- ever had to clean up the sediment that they've contaminated. In addition, they've profited, they've benefited from not having to install pollution control technologies to stop that discharge.

And, finally, I think it is somewhat relevant that the shipyards are in an unprecedented level of financial stability right now. I think I included in my letters some articles discussing the contracts that both NASSCO and Southwest Marine have received.

Page 64

These are shipyards that are very financially secure and very capable of cleaning up all of their contamination, and we urge you to do right by San Diego Bay and restore the health of this patient. Please restore the levels to background. Thank you.

MR. PIERSALL: Nicole, what are you proposing as background level? We had this discussion as to what background level is, and my understanding is you go out to a spot in the bay and say, okay, here's the reference and you restore it to that. It's not necessarily as pristine as if the shipyards have never been there.

So you're going out to a bay that's polluted and saying, you restore this part to this polluted part.

MS. CAPRETZ: They tried to pick the site where they feel those sediments would be at if the shipyards were not there. If the shipyards had not polluted that site, this is the level of cleanliness those sediments would be at.

MR. PIERSALL: How do you pick that?

MS. CAPRETZ: Well, I believe they pick that based on sort of the urban runoff that might still exist at the shipyard site, and try to identify another site comparable in San Diego Bay. So that if the shipyards weren't there, then they would have the same level of contamination as another site.

MR. PIERSALL: Who is "they"?

MS. CAPRETZ: Oh, the Regional Board staff.

MS. BLACK: Are you looking for this board to set a goal level in terms of cleanup -- well, I wrote it down. So you're looking for a cleanup goal that needs to be set and then cleanup levels? Do you see my question? In other words --

MS. CAPRETZ: Yeah, that could be one approach. It could be that you set the cleanup goal that, A, we want to remove 100 percent of the toxic sediments, and therefore the associated cleanup level would be background reference. Or you could say we want to restore the health of the bay or the sediments so that there is 0 percent toxicity or 2 percent toxicity, and that would be associated with the cleanup level as well, which would very likely be background reference.

MS. BLACK: So you're looking really from this board, you're looking for really both. One may be the goal, the base from which a cleanup decision would be made.

MS. CAPRETZ: Right. But I just want to reiterate that we feel strongly that the law actually mandates that you clean up to background, and making a decision about what your goal would be is almost secondary because the law in our opinion is very clear about the direction you're supposed to go, and that is -- unless you can give me

evidence that you cannot restore these levels to background, then you must restore them to background.

DR. DAY: Do you have an answer to the concern that it may destroy the marine benthic community that's there now?

MS. CAPRETZ: That the cleanup may destroy the...

DR. DAY: The dredging.

MS. CAPRETZ: Well, I mean, my initial response is to say that the benthic communities there are already destroyed.

DR. DAY: That's really not true totally.

MS. CAPRETZ: Not totally, that's probably accurate. Like I said, that was sort of my first reaction. But certainly they're not in good shape. Certainly they're unhealthy, and I think we do have evidence to show that.

And, in fact, Southwest Marine in a recent litigation, a certain part of their facility was actually shown to have no life forms, to have no benthic community. So certainly there are areas that are dead zones at the shipyards.

I think that our main task is to do the best we can to restore the health of the bay and remove the contamination. And, yes, there is going to be some fallout. There is going to be some impact to the benthic community that we don't want.

But, you know, using my cancer analogy, it's sort of like someone who gets chemotherapy. There are side effects, but you're always looking to your ultimate goal which is to restore the health of the bay or restore the health of the body for the human.

CHAIRMAN BAGLIN: Thank you. Cara Franke?

CARA FRANKE,

MS. FRANKE: Hi, good afternoon, Chairman Baglin and board members. My name is Cara Franke. I've been a resident of San Diego for five years now and currently a graduate student at San Diego State University.

Before making your final decision, I urge you to consider the effects that pollution has had on the residents of the community surrounding the shipyards. These communities are Barrio Logan, Sherman Heights and Logan Heights, and they are adjacent to the shipyards and share water boarders.

Many of the residents in these communities are suffering due in part to the pollution from the San Diego shipyards. I'm sorry, I lost my place. The sediment pollution in the bay has not allowed the residents to swim or fish in their neighborhoods, and those who do are putting their health at risk.

I urge you to put the rights of people

before the right of big business and set up cleanup levels to background. This can help to restore both the health of the bay and the health and welfare of the San Diego residents who deserve to swim and fish in their bay. Thank you for your time.

CHAIRMAN BAGLIN: Thank you. After Mr. Peugh is Amanda Cross and Mario Terero.

JIM PEUGH,

MR. PEUGH: I'm Jim Peugh again representing San Diego Audubon Society. I had a really neat speech and there's so many things I wanted to say. I've already blown it, so I'll just use the introduction from it.

We really want to see copious and healthy fish and wildlife in the bay, and we want to see a full range of human uses in the bay. Partial cleanup is not fair to the citizens of San Diego and the citizens of California, and it's really not fair to future generations.

Now I'll get into the hardest part to say. Hearing the talk about the AETs, this idea of pushing really close to the threshold of mortality and interpreting it is a real strange way. First, I'm sure all of you have dealt with statisticians at one time in your life, and in dealing with outliers, data that doesn't fit the rest of the data, is always tough and it's always hard to deal with.

When you saw on the AET examples where they had the row of green dots and then they had the red dots in the other direction, what they were doing was they were throwing away any data that doesn't agree with where the maximum green dot is. I can show you the foolishness of this.

If you can imagine a macabre test where we're going to see how -- we have a line of 20 cars in the parking spaces along the side of the road, and then we're going to see which one of those cars, is it car 12 or 18 or 20, you can jaywalk and get across without being killed. And so we have a bunch of people that have stopped, and we're using them for this test.

And so the first couple of guys run across, and then they start with car 20 and car 18, and they get across before the car coming down the street gets them. And then we have sort of a mixed, you know, some people make it and some people don't.

And then there comes along this really young strapping fellow in a car, and he says I can do any of this. He waits until the car gets just four car lengths from where he's going to run across, and he runs across. It happens to be a sports car, it's real little, and he's a hurdler and he jumps over it and he makes it.

So the apparent effects threshold now is four car lengths. You can actually get across the street with only four car lengths to spare. There are bodies all over, you know, there are red dots down the street that say that there's lots of mortality here, but this one guy indicates that the threshold is four.

They didn't go and look into any of those points to see how they were explained. They didn't look to see if there was a sports car and it was a hurdler. They were just throwing the points out if they don't agree with their threshold. That's bizarre; that's not scientific. You cannot functionally use a threshold that's based on that kind of thought.

The next is we're talking about -- as far as another safety factor that you're just not getting, you know, you go out and you make these measurements and you assume that the sediments are stable. You know, at some point you say, well, all the contaminants that are still there are down below this, so it's okay. The contaminants aren't stable; they're mobile.

Those neat little animals, the worms and the crabs and the things that they showed us are moving through this mud, and they're moving up and down. Towing cables off barges and ships will drag through the mud and disturb it. The other things that we do, prop wash will disturb

the sediments.

So if you're cutting it really close like this, you've got no guarantee that the measurements you make on what the contaminants are on top is going to be that way in the future. It won't be there.

Another one was the thing about -- the statement was that if you're above the AET level, that you're not disturbing beneficial uses and there is no biological harm. That doesn't make sense. All it tells you is that something didn't die.

There are other forms of biological harm. We know that contamination causes reproductive problems. The AET didn't measure that. So you can have a species or an individual or a group of individuals that will survive, but they'll never reproduce. Those have really been harmed.

We know now that there are levels for toxicity that won't kill you, but it will affect your immune system. So the toxicity won't get you, but your immune system won't cope with the next virus that comes along. That wasn't measured either. So there can be lots of harm still staying below that AET threshold.

So, again, the AET threshold is meaningless for determining biological harm for beneficial uses. And the only way I can see that you can get -- is the full cleanup. And, boy, knowing what background is, I don't

know how you're going to figure that out, but it really has to be taking out all the contaminants that have come from this industrial use.

And you talk about what's practicable. We aren't talking about huge numbers, unless I read those graphs wrong. They were talking about in one case to do the full background cleanup was $8 million, and then the full background cleanup on the other one is $12 million. Those are not huge numbers for a cleanup.

We're talking about a bay that's worth lots and lots of billions of dollars to us and future generations. We're talking about developments, single developments that will go in one of these locations of $300- and $400 million. If we can increase the desirability of a property like that, numbers like $8- to $12 million just are really not large numbers.

And then you can go back to --

CHAIRMAN BAGLIN: Jim, I'm going to have to ask you to wrap things up.

MR. PEUGH: Okay. I'll try real quick.

The issue is they're going to go out and clean up to the point where they have to by these indicators, and they've indicated that they'll go out to the full background level if they have to. That shows that cleaning to the background level is practicable. So

I think just the fact that they've made that offer means that you have no alternative but to go to the full background level if you can figure out what that is. Thank you.

CHAIRMAN BAGLIN: Thank you.

AMANDA CROSS,

MS. CROSS: Good afternoon, Chairman Baglin and board members. My name is Amanda Cross, and I'm a 21-year resident of San Diego and a concerned citizen.

In the political and social arena today we hear a lot about accountability, holding individuals accountable for their actions. It's equally important, however, that this be applied to the private sector. Private sector companies need to be held accountable for the effects that they have on communities and environments that they are located in.

On that note, I would ask that you hold the shipyards in San Diego accountable for the effects that they have had on San Diego communities, such as Barrio Logan, Sherman Heights and Logan Heights and the environment, and support holding shipyards, San Diego shipyards responsible for cleaning up San Diego Bay to background levels. Thank you.

CHAIRMAN BAGLIN: Thank you. Mario Torero?

MARIO TORERO,

MR. TORERO: We're going to be showing some slides. This is the map of Barrio Logan. My name is Mario Torero, and I am an artist and resident in Barrio Logan in the community. I've been working with Chicano Park for many years.

This is the area of Chicano Park in the waterfront, and there is the bridge down the middle. And on the left side is the little park there called Crosby Street Park. This little area there, it's the only outlet for all the southeast of San Diego, and this is where the people go and have some recreation.

Now, in that area there is a pier here next to a little beach. Of course it says no swimming nor any fishing. Although just north of this area on the other side of 10th Avenue landing there, there's another pier there in which they can fish right next to the Campbell cleanup.

Of course, in this pier there in Barrio Logan, although it says no fishing and no swimming, it looks pretty much like Shelter Island sometimes. Perhaps because people who are in that area do not get out of their own barrios into other areas, so they go there for recreation. But I know, we know that these people are eating the fish.

Also, you may say no fishing, but these kids there, they do not take the trolley nor the bus to get out of the area. It's very hot. They're there already. There's not much going on for activities for these kids. That's why I'm trying to create a cultural arts center there. But instead this is the way they recreate themselves. They go in the water and they -- you know, I did that when I was a kid in that area.

It's an ongoing thing that goes on no matter how many signs you put across there in no matter how many languages. I'm saying they need to put some showers at the end of that little park there that was built by the port.

So what we've done on our own is we've gone and tried to clean up this little beach. There's a little beach. It's called Kakito (phonetic) Beach. And we've been cleaning it ourselves with the kids. We bring canoes and a boat there to incite them to join because this water source here is right in our backyards, and we have never used it. And it's about time that we start using our own resource; right?

So this just happened two or three weeks ago. A nice article came out on it in the San Diego Union in which we say "Kids Take the Yuck Out of the Beach." Now, the kids went in the water on that day like they always do. We did not encourage nor discourage. We are just taking

the data down, and the San Diego Baykeepers helped us in making this thing happen. They have taken some samples of the water. We have still yet to see what the pollutants are.

But this is the area where the community -- and you know the impact of the numbers are tremendous there. And actually some people are just barely discovering the place because in the past years because of the wars between the barrios, the Shermans and Golden Hills could not come to Logan. But now that's in the past, and so there's more people coming to the waterfront.

Since we cannot keep the people out, we must clean the water for them. Even if we built a wall around NASSCO and the pollutants so they can contain their pollutants while they clean it out, at least stop this from getting worse anyway.

And the leaflet that I passed around is another event that we're doing this weekend which evolves around cleaning the beach. I called the port yesterday, and they're going to be going there to clean up only the dry land, but the water area is another situation which has to be taken care of. Thank you.

CHAIRMAN BAGLIN: Thank you. The last two speaker slips I have, first is Marco Gonzalez and then last is Laura Hunter.

MARCO GONZALEZ,

MR. GONZALEZ: Chairman Baglin, members of the Board, my name is Marco Gonzalez. I'm here as counsel for San Diego Baykeeper. I'm here to support EHC and to reiterate some of the points that we made in our letter regarding the sediment cleanup levels.

We understand this is a difficult decision that you have to make, but I'd like to make it much easier for you. I'd like to come back and revisit this wonderful State Water Board Resolution 92-49 and talk about one word, that is the word "if."

Now, those of you up here who are parents -- and I think all of you are -- use this word quite often with your children or have in the past, "If you don't clean up your mess, you're not going to go outside."

"If background levels of water quality cannot be restored," that is unequivocal. Before that you have this word "reasonable," and you have a comma after that clause. Attorneys, we take these sentences and we break them down into their most simplest pieces, and you have the sentence, "if background levels of water quality cannot be restored." Then comes "reasonable."

When you get to the reasonable level of water quality that you're going to choose if background levels cannot be restored, then you take into consideration

the full range of social, economic, tangible and intangible objects.

Now, I think Nicole hit the nail on the head. This resolution has two parts to it. It says technological feasibility is one large one. This isn't rocket science. You don't have to go out there and perform some amazing experiment or some amazing disappearance act in order to clean up the sediment. You have to go out with a big dredge, and you have to pull up a lot of dirt.

Now, where the cost comes in is you've got to dispose of that. And with all due respect to Mr. Day, there is this notion that you're going to resuspend the fine particles and that you're going to actually harm not only the communities that are living in the water column, but you're going to displace the existing benthic community.

Well, let's look beyond this week or beyond this month. We're talking about cleaning up the bay for some period of time in the future. Yes, there are going to be short-term impacts. Yes, when you pull up sediment, you pull up critters and you're displacing them. We're not saying that you're going to have to filter out all the critters and throw them back in the bay.

But the benthic community as has been shown in repeated studies throughout the bay is fairly vagile,

which means that they move around quickly. They have the ability to recolonize, and, furthermore, scientists can reintroduce these species given one point, they have to have clean sediment to recolonize. That is the imperative.

Now, I want to take you back real quickly to what you saw up on the screen by staff, and that was the description of what apparent effects thresholds was at the Campbell shipyard when they did their site-specific determination. You saw a line of green dots. Below that you saw hash marks with two red dots, solid with two more red dots.

Clearly two of those toxic spots were to the left of that line that they said was the threshold for toxicity. Clearly if you choose anything under the purview of apparent effects thresholds you are going to admit that you're going to accept some toxicity. That's unacceptable. The law says, if you cannot reach background levels. We have no showing that we cannot reach background levels.

We've had no economic feasibility studies shown. Instead what we get is this pullback, and it's not surprising to us that NASSCO would come forward and choose conveniently the least expensive option or choose a method that will allow them to tweak the science to show what is best for them.

And, similarly, we don't find it all that surprising that NASSCO and Southwest Marine have given you a ton of cost numbers without backing those up. It used to be $7 million. Somehow it jumped up to $12 million now. We need to start asking tougher questions and start mandating from them some more concrete evidence of their economic sustainability.

It's really disheartening to think about where these companies in particular make their profits. Because let's not forget, they are private industry but they make their money from contracts with the Navy. You and I support the Navy. We pay our taxes to the Navy. We pay our taxes to these people who dirty up the bay and then come back to us and say, sorry, we don't owe you anything more than the very bare minimum, apparent effects threshold.

There is no cost benefit analysis to be made here until you've reached that first portion of can-you-do-it, and I say we aren't going to meet that. When you start looking at the profits that these companies generate, $12 million ain't going to break the bank.

So to end on something that Laurie asked about what are we asking you to do here, the environmental community, to set a management goal and from that get a level. I'm going to say the policy that we know you're

Page 81

charged with making has already been determined by the state water board. It's not a difficult decision for you.

I think if you take a step back and look at what is the legally mandated requirement, it's not a cost benefit analysis. It's not how do we get the best bang for our buck. It's not let's draw a line to point at which the money we spend gives us the most for our return. It says can you do background, period.

CHAIRMAN BAGLIN: Thank you.

LAURA HUNTER,

MS. HUNTER: Yes, again, Laura Hunter from the Environmental Health Coalition. I always feel really old when this issue comes up because I've been dealing with it for so long, and, yes, I was there when Campbell's level got set.

And I would really like to just share some history with you so we can just dispense with even thinking or looking at the Campbell's level again when there were two things that were promised us when that level was set. No. 1 -- well, let me talk about conditions first of all.

The conditions under which that level were set was, one, we had no exhaustive bay protection toxic cleanup study. There's a huge effort that's happened since then. We did not have that. The port had no information

Page 82

like that. We were also, very frankly, war weary.

Every one of these sediment cleanups that we had been through had been an all-out war through litigation, it went on and on. We were worn out. And this level was accepted as a compromise. We all knew it for two reasons and two reasons only. One, we were promised that it be no precedent for the other shipyards, and, two, we were going to get fast fast cleanup which we were all desperate for because the cleanups had been taking five and six and seven years.

Wrong decision, wrong strategy, admittedly. Compromise, once again, did not serve the environment. We shouldn't have done it, and I think hindsight is 20/20.

I want to touch on -- and, in fact, I'm sure you all remember there had been two one-year extensions to that order, so we really didn't get what we thought we were getting.

I wanted to touch on a couple of other points relative to Campbell's cleanup. At least one of the peer reviewers said that Campbell's AET was not even appropriately derived for Campbell. Not only is it not appropriate for our shipyards, but it actually wasn't appropriately derived for Campbell itself, that there wasn't enough samples. Other scientists disagree with that, but I think the best you can say about that level is

Page 83

that the scientists disagree on it.

Next, the sediment levels of contamination are very different between Campbell and the other shipyards. Again, they're not applicable. I want to correct one thing that I think -- I'm worried that Vicente left an impression that somehow ERMs are not based on biological data.

Actually, I believe they are based on biological data, lots of different studies. And it's a median or a 10 percent at which this biological data showed effect. I think it's really a measure of confidence level in terms of biological response, but I don't think it's accurate to say it's not based on any biological data.

There was a statement made by Mike Chee from NASSCO that earlier boards never set a cleanup level at background. Well, there's a couple responses to that. I'll just refine it to a very few. First of all, it's irrelevant. Most of those levels except for Campbell's were set between 8 and 13 years ago.

Again, there is a lot of information we have now that we didn't have then, and probably the bay is more polluted now than it was then.

I also want to point out this issue of resuspension because I think that this in this case is a red herring. First of all, generally we say the dredging

Page 84

has an immediate effect; it kills what's there. But it also has the resuspension effect. Those sediments in the shipyards are getting resuspended every day by the prop wash, I mean, they are constantly being resuspended.

I think where this kind of argument is valid is in a place like Convair Lagoon where the contaminant you're dealing with is in deep in the sediments. And if it is dredged up, it is resuspended and then it is biocumulative. So at any level it's dangerous. But Convair Lagoon has no resuspension mechanism, and we've removed any possible resuspension mechanism from that, and that's why boats are kept out of there, so we don't resuspend it. It's not really an applicable issue here.

The levels selected for Paco, that was copper ore. That was a very very different kind of contaminant, a different kind of waste and is not an applicable level to use with this point.

Just a couple other random points in response to what I've heard. Insurance companies paid for lots of sediment cleanup at other sites, and I think you're on the right track to ask just how are they going to claim on that.

And I want to point out that frankly this is not all that hard. Look how much dredging the Navy has done in the past few years, millions and millions of cubic yards they have dug, some of it contaminated. So it's been my experience that the polluters have fought these cleanup orders, but once they've lost, which they always have, the cleanup gets underway and it goes very quickly.

And it always seems to come down to a question of will the polluters spend their money fighting cleanup or spend their money cleaning up. And once we get them cleaning up, it does not take that long and it's not that hard. We urge you to direct them. Thank you.

CHAIRMAN BAGLIN: Thank you. Those were all of the speaker slips that I had on the subject. Did I miss anyone by any chance? Then I'll close the public comment and call for board action.

John, could you clarify for us again the action that you are asking from us today, help put it together for us, and then what happens after that.

MR. ROBERTUS: The action today was to conduct a public hearing and take testimony on this matter. Because the staff report was so extensive, and it was a dynamic document, by the time we got it out we immediately were notified that people wanted more time to look at it. So I made the decision after talking to the chair to extend the public comment period beyond today's meeting. But today basically afforded the opportunity for the public hearing.

We will be waiting for public comment to

come in in written form and close it -- I'm not sure of the date.

MR. RODRIGUEZ: The 19th.

MR. ROBERTUS: The 19th of this month. And then the public comment period would be closed, and we would prepare staff a review of documents and staff comments that would be provided to you for next month's board meeting, regularly scheduled board meeting, to then make a decision and have board discussion on the comments that have been submitted.

It is not anticipated at this point that there would be a further need for public comment in the oral form, a public forum.

CHAIRMAN BAGLIN: So then it's appropriate now for us to if we have any questions, any clarification that we think we need to perhaps discuss that. But as far as actually discussion to arrive at might be premature at this point in time because we'll be getting more written for the next meeting.

So our action will be at the next meeting, and anything right now would be if we have any questions, clarifications to staff or if we wanted to make any comments that those who are present, that they may wish to get written materials back into the file also that would help us in our determination next month.

MR. PIERSALL: One of the things that I would like to see staff do is come up with, I guess, a numerical value. If we say, for instance, I would like to see the contaminants taken out. Now, I don't know whether that's to background level or beyond background level or what. But I would like to see the contaminants and the toxics removed, period.

If that's not possible, I would at least like to see them removed to a certain level, a fairly low level. I'm not sure what that level would be, but that's what I would like to get information from the staff as to what would be a reasonable level to make sure that as much toxics be removed as possible. You understand my concern there, John?

MR. ROBERTUS: I thought that's what we've been trying to do.

MR. PIERSALL: Well, there's been some question about what is background, and my understanding of what John says is you can go out and you pick some spot, and you say, okay, we're going to use that as a background. And if you do that, then I'd like to know what level of contamination is in that background because I don't know where and how you would select it. I don't know how you would go out on that bay and say, well, we'll just select right here and use that as a background level.

MR. ROBERTUS: Well, we pointed out that there is a point in the bay, a location. It was location No. 3 on the overhead that Vicente Rodriguez briefed you on. And we got the highest correlation of the three background points of 70 percent with the characteristics of the site and the characteristic contaminants. The match was the closest of the background locations where we had the chemistry data.

So that's what we are using at this point, and that's our recommendation if that is background. The the definition for the background point, however, is in terms of chemistry, sediment chemistry. We do not have the infauna data, the inventory of what is out there, the biodiversity of what is living in background, and I don't know that I can do that by the next board meeting. I'm confident I cannot do that by the next board meeting.

MR. PIERSALL: I think that's going to have to be part of what we're looking for. If we have biological contamination in there, we don't want to say, well, just remove the chemical data, chemical effects and don't worry about the biological. I don't think that's what we want at all, because both of them have got to be part of the solution.

MR. ROBERTUS: Perhaps I can take a couple of minutes and bring it back to the reference point that I pointed out when this agenda item began today, and that is the last time this board looked at this issue, the Board made a decision to use the AET level at the Campbell shipyard which was derived with what you're calling biological information and sediment chemistry information. And the AET value would be used as it had been at Campbell, it was to be used at these other two shipyards that have been discussed today.

And at that point in time, there was some concern that it might not be appropriate to take an AET from one shipyard and just generically transfer it to another one even though staff recommended that because of the proximity and the similarity of activities and pollutants.

So since that date March of 1999, we have been trying to get more information that you could use to make your decision. And, in fact, the economic information is derived from a model that was developed by the state board assisting us. So you have a lot of information about the economics of this decision that you did not have previously.

There are a number of other things that are ongoing, and we will continue to learn more. The problem is that the longer, the more time it takes the more information I will be able to get and bring to you, but the contamination or pollution of the contaminants remain in

place.

What I can't tell you is whether or not the cleanup levels at the previous sites in the bay that were cleaned up to AET either are or are not protective of beneficial uses. That's one of the problems that we have. After the cleanup is completed, I can't tell you -- I like to use the canary in the mine comparison -- that, yes, it does in fact now support the array of beneficial uses that exist in the bay at any one of these sites. That's the nature of the decision.

MR. PIERSALL: It's my understanding that the biological data was not considered on the Campbell yard.

MR. ROBERTUS: That's correct. In August of 1995, a letter was sent to the shipyards, to three shipyards requiring -- and this was by the executive officer's signature at that time -- requiring them to do a full assessment of the contamination at the leaseholds for the shipyards.

Campbell did, in fact, do that complete work and presented it, and today we now have their AET that is well-known. NASSCO and Southwest Marine never did do that assessment. They did chemistry work, but they never did the workup for the toxicity information because it's very expensive.

MR. PIERSALL: Did Campbell?

MR. ROBERTUS: Campbell did do it, yes.

MR. PIERSALL: So we do have biological data from Campbell.

MR. ROBERTUS: Yes, and that's why that data -- to use that data at the other two shipyards was requested by NASSCO and Southwest for two reasons. First of all, it's a cleanup level, and second of all, it's an AET value that was already obtained at great expense by Campbell. They requested that it be used, and the Board made the decision that it could be used.

MR. PIERSALL: So is staff recommending the AET level from Campbell or the other yards? Is that what you're saying, using that as a background level?

DR. DAY: No, they gave us five options.

MR. ROBERTUS: Not today. I do not have a specific recommendation for you today.

MR. PIERSALL: I'm still trying to get to where you took the background level from. Did we take that from Campbell's yard or some other spot?

MR. ROBERTUS: The recommendation at the last board meeting when the Board decided to issue the interim cleanup levels were derived from, first of all, the Campbell shipyard cleanup -- oh, the background? The background was from the three points that were briefed today by Vicente Rodriguez and not at Campbell.

DR. DAY: They're away from the shipyards.

MR. ROBERTUS: Yes, they're not in the shipyards.

DR. DAY: I mean, they explained the background very carefully.

MR. PIERSALL: What kind of testing was done in those background levels in order to come to that background level? In other words, if we say, okay, this is the background level we're talking about, do we know that it's fairly clean, that it's not toxic?

MR. ROBERTUS: No, the background levels are areas that are not clean, but they are impacted by all the other what I'll call ambient discharges that have historically and are currently impacting the bay, but not the shipyards.

In other words, we're trying to find out what parts of the bay are the best representation of the ambient, the levels of contamination that have come from all other sources without getting too close to any one.

MR. PIERSALL: My concern and my question is, if we did an analysis of those background levels taken from those different points, would we have a reasonable level of cleanliness there, or is it still going to be contaminated?

If it's going to be contaminated, then it doesn't make much sense to me to take a contaminated spot and say, well, that's our background and you can clean up to that and we'll go along with...

MR. ROBERTUS: We don't know that. The first actual random sampling of San Diego Bay was done in 1998. There was previous sampling, but it was always skewed toward locations that were known to have contamination. And the Bight 98 sampling of the bay, the data is available, but the analysis is not complete.

So I don't know that. The staff in the last few years has designated certain points as what we feel are representative background locations and we've tried to rather than averaging all those values and saying here's an average background, we've tried to get a background location that is most representative.

MR. PIERSALL: It just seems to me it would be an exercise in futility to pick a spot for background level that we have no idea what's there.

MR. ROBERTUS: Well, certainly if we picked another background location, it would change I would hope very slightly.

MR. PIERSALL: My concern is can we pick a spot in there that's not contaminated to above the level for the community we're trying to protect.

CHAIRMAN BAGLIN: I've got some other people who want to ask some questions. Maybe you should...

DR. DAY: Is it fair to say that the three spots that the staff chose for measuring background are currently

having beneficial use, like sailing and swimming and things like that in the bay?

MR. ROBERTUS: Yes.

MR. PIERSALL: You can sail right across the area where the shipyards are too.

DR. DAY: Also swimming and they're not being condemned, and they're probably the best parts of the bay they can find. Now, it may be that all parts of the bay have some problems, but that's not the issue.

MR. PIERSALL: No, the issue is finding a spot that's not contaminated beyond the point of beneficial uses.

DR. DAY: And that's why I asked the question that I did. They're being used for beneficial use. The three background spots that the staff presented to us today are currently being used as beneficial uses. The area around the shipyards are not.

MR. PIERSALL: Well, just down from the shipyards in Logan Heights they're down there swimming and playing and all that. So they are using it.

MS. KELLER: Is it appropriate for me to ask a question of a representative from the environmental community?

CHAIRMAN BAGLIN: Okay.

MS. KELLER: Nicole, if the Environmental Health

Coalition was going to recommend one of those options, would it be Option 1? You know, we had the six options that they were presenting to us.

MS. CAPRETZ: Yeah, I'm forgetting. Was Option 1 clean to background reference?

MS. KELLER: To background reference, yes.

MS. CAPRETZ: Right, yes. Is that your question?

MS. KELLER: Yes, that is my question, and you could expand on some written comment too before the 19th. It might be helpful.

DR. DAY: Could I ask her a question?

MS. CAPRETZ: No.

DR. DAY: Did you believe that the three places that the staff chose for background measures were reasonable places?

MS. CAPRETZ: Yeah, we did. I mean, I'm definitely understanding Frank's point, but I think that we're trying -- I think what staff was trying to do was find sites in the bay that are comparable to what the shipyard sites would be if they weren't polluting into the environment.

In other words, there's still going to be contamination coming into the bay from all different areas, typically from urban runoff. So it's kind of comparable to what other sites would be if they just had urban runoff,

for example, as the pollution and they didn't have the shipyard waste. So, yes, the answer is, yes, we felt that background reference they chose was reasonable.

MR. PIERSALL: That's the kind of answer I was looking for.

CHAIRMAN BAGLIN: How about if Laurie could have the floor right now.

MS. BLACK: This is the proposal from NASSCO. It was actually fronted by a letter from Janice Grace (phonetic) on September 21. And on page 5 it says, "Moreover, remediation to background levels is not," and it's underlined, "legally required." So it's not legally required of NASSCO; however, is it legally required of us to make sure as we represent the waters, if you will, that it's to beneficial use? So they may not be legally responsible, but moral is another whole issue. But that being said, we have a legal obligation.

MR. RICHARDS: I think that the answer to that is that's a very simplistic statement to say that it's not legally required. It's a legal requirement basically.

Again, 13304 doesn't say anything about background, but it doesn't say anything about cleanup levels. What it says is it gives you the authority to require cleanup and abatement, and the presumption is that cleanup and abatement requires the removal of all waste and the abatement of all pollution.

So I would say that NASSCO is legally required to clean up to background under a rebuttable presumption, and the state board in interpreting that language in resolution 98-92 said that background is the starting point for your analysis. And in order to get to a cleanup level that is less good than background -- and this presumes that background is better than it needs to be to sustain the beneficial uses. To go less than background, you have to establish the fact that background is not attainable.

So NASSCO or Southwest Marine or, you know, Joe Bob's Ship and Boatyard would have to rebut the presumption that background is the appropriate cleanup level. It would have to show that it's not practical to achieve that cleanup level, and then we would set the alternative cleanup level.

Remember that you cannot have -- I mean, you cannot set a cleanup level that does not achieve unpollutedness. That's the question that Frank is raising is whether the reference sites satisfy the threshold of unpollutedness.

CHAIRMAN BAGLIN: Can I jump in? I see that Grace is about to run out of paper, and we have a lot of things I know that we have to talk about on this. But I'd like to

get direction on where you want to go now for our next meeting when we will have further written comments coming back.

Do you at this point in time as a board -- and we've gone through this before, and I don't know if I ever want to again -- want to close off public comment at this point in time? It will not be reopened at the next meeting. We will consider what staff provides us with new written comments. Or do you want to reopen it for public comment at the next meeting again?

MR. PIERSALL: I propose we close it, and we go with what staff gets from the comment period and have staff's position at the next meeting and discuss it from there.

MR. MINAN: I'd be inclined to reject that approach since there may be materials that are distributed to the Board that are worthy of continuing public comment. This is an extraordinarily important issue.

I realize the benefit and the efficiency of closing it at this point, but I am concerned that there may be certain materials that are given to staff that people may oppose and object to, may not have an opportunity to find out about those materials, and then we're, I think, in the danger of depriving someone of due process.

MR. PIERSALL: Are you looking for another

5-hour...

MR. MINAN: Well, these are important issues, and if it takes 5 hours the answer is yes. If it takes 10 hours...

CHAIRMAN BAGLIN: How about can I ask you, your positions have been stated here. Can I start down at this side and get yours and hopefully we'll get to a conclusion tonight.

MS. BLACK: I believe that this hearing was well-noticed. Anybody who had public comment is here. We may receive some more materials, some more letters, but that being said, I don't think that I'm going to need to have -- I have already read a lot of materials here, and I'm a lay person. I mean, I'm trying to understand the science.

I don't believe that anybody else is going to be able to stand up and give me any more information than I already need to come to some conclusions. I may receive more materials, and I welcome them to read them over the next month. So I would vote to close the public hearing.

MS. KELLER: I'm a little bit conflicted. I agree with Laurie, but then I agree with Jack. I'd like to hear what Counsel John Richards has to say about what are the legal ramifications of us closing the public comment

period, the public hearing.

MR. RICHARDS: I think in this case you're dealing with a policy question rather than a legal one. I think that Laurie is correct in saying that there has been adequate notice.

You are providing an opportunity for people to review the staff report and provide written comments. So I think that in terms of due process, we can defend the actions that you have taken by providing this opportunity for public comment, by providing further opportunity for written comments, and you do not need to provide further opportunities for comment to satisfy the requirements of due process. Whether you feel that you need to provide further opportunities to satisfy public concerns, it becomes a different issue.

MS. KELLER: I understand what you're saying. I mean, I can vote right now on the whole issue, so I think I'll just go with Laurie. I'm a little bit curious why we extended the public comment period, if you can shed some light on that maybe.

CHAIRMAN BAGLIN: I can check very easily. Mr. Robertus, could you respond to that?

MR. ROBERTUS: After talking to the chair -- actually, the complexity and the depth of the staff report, when people got that in their hands, we only gave them a couple of days to get the material back to meet the cutoff date for this hearing.

There was a request from a number of people in the public arena to give them more time, so I made the commitment and I conferred with the chair and made the commitment to extend the public comment period after the hearing.

MS. KELLER: Well, then I can go with Laurie, because I read every piece of paper in here, as painful as it is. So I'll read everything that I get for the next board meeting, and I'll be able to make a fair decision. So I'll go with Laurie; we're going to close the public hearing.

DR. DAY: I'm in favor of closing it. We've been here before. Once is a mistake, more than once is a pattern. I think that there's an infinite number of new things that can come to our attention, but I'll make only one point of many that I made the last time we were at this position, and that is that there's more than an infinite number of things which we have otherwise to do.

If we bounce something else off the agenda, we may come to regret it which I think is exactly what happened the last time we did this.

CHAIRMAN BAGLIN: I'm in favor on this issue of also terminating the public comment on it. So what I see

is that five of us are at that, and there's one dissenting vote on it. So this will complete our public comment on the San Diego Bay sediment cleanup level issue, and it will come back before us at our next meeting for final a determination.

MR. RICHARDS: Qualified by the fact that the opportunity for written comment remains open.

CHAIRMAN BAGLIN: Yes, it does. So, Mr. Robertus, can you remind me of what the cutoff date is for that written comment.

MR. ROBERTUS: The 19th of October.

CHAIRMAN BAGLIN: So with that, we will continue this item to our next scheduled meeting, and we will take a recess until 4:45, and then we will continue with Item No. 10.

(Whereupon, Item 9 was concluded for the day.)

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STATE OF CALIFORNIA
REGIONAL WATER QUALITY CONTROL BOARD
SAN DIEGO REGION

AGENDA

Wednesday, October 11, 2000
9:00 a.m.

Metropolitan Wastewater Dept. *Auditorium* *9192 Topaz Way* *San Diego, California*

The Regional Board requests that all lengthy comments be submitted in writing in advance of the meeting date. To ensure that the Regional Board has the opportunity to fully study and consider written material, it should be received in the Regional Board's office no later than 5:00 P.M. on Wednesday, September 27, 2000. If the submitted written material is more than 5 pages or contains foldouts, maps, etc., 20 copies must be submitted for distribution to the Regional Board members and staff. Written material submitted after 5:00 P.M. on Wednesday, October 4, 2000 will not be provided to the Regional Board members.

Pursuant to Title 23, California Code of Regulations, Section 648.2, the Regional Board may refuse to admit written testimony into evidence unless the proponent can demonstrate why he or she was unable to submit the material on time or that compliance with the deadline would create a hardship. If any other party demonstrates prejudice resulting from admission of the written testimony, the Regional Board may refuse to admit it.

Except for items designated as time certain, there are no set times for agenda items. Items may be taken out of order at the discretion of the Chairman.

1. Roll Call and Introductions

2. PUBLIC FORUM: Any person may address the Regional Board at this time regarding any matter within the jurisdiction of the Board which is not on the agenda. Presentations will be limited to five minutes. Submission of information in writing is encouraged.

3. Minutes of Board Meeting of September 13, 2000

4. Chairman's, Board Members', State Board liaison's and Executive Officer's Reports: These items are for Board discussion only. No public testimony will be allowed, and the Board will take no formal action.

Consent Calendar: Items 5 through 6 are considered non-controversial issues. (NOTE: If there is public interest, concern or discussion regarding any consent calendar item or a request for a public hearing, then the item(s) will be removed from the consent calendar and considered after all other agenda items have been completed)

5. NPDES Permit Issuance, Wesselink and Son Dairy, Riverside County (Tentative Order No. 2000-206, NPDES No. CA0109321) (John Phillips).

6. Waste Discharge Requirements: City of San Diego South Bay Water Reclamation Facility, San Diego County (Tentative Order No. 2000-203) (Dat Quach).

Remainder of the agenda (Non-Consent Items):

7. Adoption of an Order Concerning Administrative Assessment of Civil Liability against the City of San Diego for Sanitary Sewer Overflows. The Board will act on testimony received during the June 14, 2000 hearing and the discussion of Supplemental Environmental Projects during the August 30, 2000 meeting. The Board will consider adoption of an order addressing assessment and suspension of monetary penalties in consideration of Supplemental Environmental Projects (Tentative Order No. 2000-103) (Rebecca Stewart).

8. NPDES Permit Renewals (Todd Stanley):

   a. South Bay Boatyard, Discharge to San Diego Bay (Tentative Order No. 2000-213, NPDES No. CA0109126), San Diego County.

   b. Driscoll Custom Boats, Discharge to San Diego Bay (Tentative Order No. 2000-207, NPDES No. CA0109061), San Diego County.

   c. Driscoll's West, Discharge to San Diego Bay (Tentative Order No. 2000-208, NPDES No. CA0109070), San Diego County.

   d. Koehler Kraft, Discharge to San Diego Bay (Tentative Order No. 2000-210, NPDES No. CA0109096), San Diego County.

   e. Nielsen-Beaumont Marine, Discharge to San Diego Bay (Tentative Order No. 2000-211, NPDES No. CA0109100), San Diego County.

   f. Knight and Carver Yachtcenter, Discharge to San Diego Bay (Tentative Order No. 2000-209, NPDES No. CA0109088), San Diego County.

g. Shelter Island Boatyard, Discharge to San Diego Bay (Tentative Order No. 2000-212, NPDES No. CA0109118), San Diego County.

h. Oceanside Marine Center, Inc., Discharge to Oceanside Harbor (Tentative Order No. 2000-215, NPDES No. CA0109304), San Diego County.

i. Driscoll Mission Bay, Discharge to Mission Bay (Tentative Order No. 2000-214, NPDES No. CA0109291), San Diego County.

j. Dana Point Shipyard, Discharge to Dana Point Harbor (Tentative Order No. 2000-216, NPDES No. CA0109312), Orange County.

9. San Diego Bay Sediment Cleanup Levels. The Board will consider adoption of resolutions establishing Bay-bottom sediment cleanup levels for the following shipyards:

a. National Steel & Ship Building Company (NASSCO) (Tentative Resolution No. 2000-122) (Vicente Rodriguez).

b. Southwest Marine (Tentative Resolution No. 2000-123) (Vicente Rodriguez).

10. Status Report on the United States Navy Programs for Environmental Protection (John Robertus).

11. Report on Total Maximum Daily Load (TMDL) Programs in California. Dave Smith of the United States Environmental Protection Agency will provide his agency's perspective on TMDL development and implementation (David Barker).

12. Status Report on Tentative Order No. 2001-01, Waste Discharge Requirements for Discharges of Urban Runoff From the Municipal Separate Storm Sewer Systems (MS4s) Draining the Watershed of the County of San Diego, the Incorporated Cities of San Diego County and the San Diego Unified Port District (NPDES Permit No. CA0108758) (Deborah Jayne).

13. ***Executive Session*** - Consideration of Initiation of Litigation.
The Regional Board may meet in closed session to consider initiating criminal prosecution against persons who are alleged to have violated the Porter-Cologne Water Quality Control or the federal Clean Water Act.

14. ***Executive Session*** - Discussion of Pending Litigation.
The Regional Board may meet in closed session to discuss pending litigation.

15. ***Executive Session*** - Discussion of Ongoing Litigation.
The Regional Board may meet in closed session to discuss ongoing litigation for the following case: Non-compliance with Cease and Desist Order No. 96-52, Referral of International Boundary and Water Commission to the Attorney General by Order No. 99-61.

16. ***Executive Session*** – Personnel.
The Regional Board may meet in closed session to consider personnel matters involving exempt employees [Authorized under Government Code Section 11126(a)].

17. Arrangements for Next Meeting and Adjournment.
Wednesday, November 8, 2000 - 9:00 a.m.
City of Encinitas
Council Chambers
505 South Vulcan
Encinitas, California

Notifications

A. On July 27, 2000, the Executive Officer issued Complaint No. 2000-166 to the City of Oceanside for violations of effluent limits contained in NPDES Order No. 2000-11. The violations meet the criteria of Water Code Section 13385 and are therefore "serious violations." Complaint No. 2000-166 proposed a mandatory minimum penalty of $3000. On August 28, 2000, the City of Oceanside submitted a check for $3000 in settlement of Complaint No. 2000-166 (Todd Stanley).

B. On July 27,2000, the Executive Officer issued Complaint No. 2000-167 to the City of Escondido for violations of effluent limits contained in NPDES Order No. 99-72. The violations meet the criteria of Water Code Section 13385 and are therefore "serious violations." Complaint No. 2000-167 proposed a mandatory minimum penalty of $3000. On August 15, 2000, the City of Escondido submitted a check for $3000 in settlement of Complaint No. 2000-167 (Chiara Clemente).

C. Pending 401 Water Quality Certification Applications (Stacey Baczkowski).

The State Water Resources Control Board revised State regulations for the 401 Water Quality Certification Program; these revisions went into effect on June 24, 2000. The revised regulations [23 CCR § 3830-3869] may be found at:

http://www.swrcb.ca.gov/water_laws/index.html or http://www.calregs.com/.

Section 3858 (a) states "The executive director or the executive officer with whom an application for certification is filed shall provide public notice of an application at least twenty-one (21) days before taking certification action on the application, unless the public notice requirement has been adequately satisfied by the applicant or federal agency. If the applicant or federal agency provides public notice, it shall be in a manner and to an extent fully equivalent to that normally provided by the certifying agency. If an emergency requires that certification be issued in less than 21 days, public notice shall be provided as much in advance of issuance as possible, but no later than simultaneously with issuance of certification."

Public notice of pending 401 Water Quality Certification applications within the San Diego Region is available on the Regional Board's web site at:

http://www.swrcb.ca.gov/rwqcb9/Programs/401_Certification/401_certification.html,

or by calling Paul Lemons at 858-467-3728 with questions about a specific project.

D. Public notification of Regional Board staff concurrence with the Corrective Action Plan (CAP) for a leaking underground fuel tank site (Site 21580) at Marine Corps Base Camp Pendleton, California (Jody Mae Ebsen).

On April 13, 2000 the RWQCB received a revised (CAP) proposing corrective actions at the leaking underground fuel tank Site 21580. Actions include excavation of fuel-contaminated soils and regular groundwater monitoring. The case files, site investigation reports, and the CAP are available for public review at the RWQCB office. The inclusion of this public notice as part of the RWQCB agenda fulfills the agency's obligation for public notification of the CAP document referenced above, pursuant to California Code of Regulations (CCR), Title 23, Division 3, Chapter 16, Article 11, Section 2728(a).

E. Public notification of Regional Board staff concurrence with Corrective Action Plan (CAP) for a leaking underground fuel tank site (Site 2459) at Marine Corps Base Camp Pendleton, California (Jody Mae Ebsen).

On March 22, 2000 the RWQCB received a revised (CAP) proposing corrective actions at leaking underground fuel tank Site 2459. Actions include implementation of biosparging and bioventing systems to enhance in-situ biodegradation of residual groundwater pollutants. The case files, site investigation reports, and the CAP are available for public review at the RWQCB office. The inclusion of this public notice as part of the RWQCB agenda fulfills the agency's obligation for public notification of the CAP document referenced above, pursuant to California Code of Regulations (CCR), Title 23, Division 3, Chapter 16, Article 11, Section 2728(a).

NOTES:

A. GENERAL STATEMENT

The primary duty of the Regional Board is to protect the quality of the waters within the region for all beneficial uses. This duty is implemented by formulation and adopting water quality plans for specific ground or surface water basins and by prescribing and enforcing requirements on all domestic and industrial waste discharges. Responsibilities and procedures of the Regional Water Quality Control Board come from the State's Porter-Cologne Water Quality Act and the Nation's Clean Water Act.

The purpose of the meeting is for the Board to obtain testimony and information from concerned and affected parties and make decisions after considering the recommendations made by the Executive Officer.

B. CONSENT CALENDAR

All the items appearing under the heading "Consent Calendar" will be acted upon by the Board by one motion without discussion, provided that any Board member or other person may request that any item be considered separately and it will then be taken up at a time as determined by the Chairman.

Any person may request a hearing on an item on the Consent Calendar. If a hearing is requested, the item will be withdrawn and the hearing will be held at the end of the regular agenda.

C. HEARING PROCEDURES

Hearings before the San Diego Regional Board are not conducted pursuant to Chapter 5 of the California Administrative Procedure Act, commencing with Section 11500 of the Government Code. Regulations governing the procedures of the regional boards are codified in Chapter 1.5, commencing with Section 647, of the State Water Resources Control Board regulations in Division 3 of Title 23 of the California Code of Regulations.

Testimony and comments presented at hearings need not conform to the technical rules of evidence provided that the testimony and comments are reasonably relevant to the issues before the Board. Testimony or comments that are not reasonably relevant, or that are repetitious, will be excluded. Cross examination may be allowed by the Chairman as necessary for the Board to evaluate the credibility of factual evidence or the opinions of experts.

The Chairman will allocate time for each party to present testimony and comments, to question other parties if appropriate; the Chairman may allocate additional time for rebuttal or for a closing statement; time may be limited due to the number of persons wishing to speak on an item, or the number of items on the Board's agenda, or for other reasons.

Unless modified by the Chairman, presentations will be made in the following order (the Chairman may allow questions regarding each persons testimony or comments after that person has finished speaking; Board Members, counsel, and staff may ask questions at any time):

1) Regional Board Staff
2) Discharger
3) Other Interested Persons
4) Closing Statements or Rebuttal by Discharger and Other Interested Persons
5) Recommendation for Action by Regional Board Staff

Note: If a hearing is requested on an item withdrawn from the consent calendar, the party requesting the hearing will testify first and the Regional Board staff will testify last.

All parties providing direct testimony are requested to remain for the entire hearing to be available for questioning.

The hearing will be closed after the staff recommendation; the Board may deliberate and act immediately following the hearing, or at some other time.

D. CONTRIBUTIONS TO REGIONAL BOARD MEMBERS

Persons applying for or actively supporting or opposing waste discharge requirements or other Regional Board orders must comply with legal requirements if they or their agents have contributed or proposed to contribute $250 or more to the campaign of a Regional Board member for elected office. Contact the Regional Board for details if you fall into this category.

E. PROCEDURAL INFORMATION

The Regional Board may meet in closed session to deliberate on a decision to be reached based upon evidence introduced in an adjudicatory hearing [Authority: Government Code 11126(d)]; or to consider the appointment, employment or dismissal of a public employee to hear complaints or charges brought against a public employee [Authority: Government Code Section 11126(a)].

The Regional Board may break for lunch at approximately noon at the discretion of the Chairman. During the lunch break Regional Board members may have lunch together. Regional Board business will not be discussed.

Agenda items are subject to postponement. A listing of postponed items will be posted in the meeting room. You may contact the designated staff contact person in advance of the meeting day for information on the status of any agenda item.

F. AVAILABILITY OF EXECUTIVE OFFICER'S REPORT AND AGENDA MATERIAL

A copy of the written Executive Officer's Report can be obtained by contacting the staff office. A limited number of copies are available at the Regional Board meeting.

Details concerning other agenda items are available for public reference during normal working hours at the Regional Board's office. The appropriate staff contact person, indicated with the specific agenda item, can answer questions and provide additional information. For additional information about the Board, please see the attached sheet.

G. PETITION OF REGIONAL BOARD ACTION

Any person affected adversely by a decision of the California Regional Water Quality Control Board, San Diego Region (Regional Board) may petition the State Water Resources Control Board (State Board) to review the decision. The petition must be received by the State Board within 30 days of the Regional Board's meeting at which the adverse action was taken. Copies of the law and regulations applicable to filing petitions will be provided upon request.

NOTE: If the State Board accepts a petition for review, the Regional Board will be required to file the record in the matter with the State Board. The costs of preparing and filing the record are the responsibility of the person(s) submitting the petition. The Regional Board will contact the person(s) submitting a petition and inform them of the payment process and any amounts due.

H. HEARING RECORD

Material presented to the Board as part of testimony (e.g. photographs, slides, charts, diagrams etc.) that is to be made part of the record must be left with the Board. Photographs or slides of large exhibits are acceptable.

All Board files, exhibits, and agenda material pertaining to items on this agenda are hereby made a part of the record.

I. ACCESSIBILITY

The facility is accessible to people with disabilities. Individuals who require special accommodations are requested to contact Ms. Lori Costa at (858) 467-2357 at least 5 working days prior to the meeting. TTY users may contact the California Relay Service at 1-800-735-2929 or voice line at 1-800-735-2922.

DIRECTIONS TO REGIONAL BOARD MEETING

Metropolitan Wastewater Department
City of San Diego
Auditorium
9192 Topaz Way
San Diego

Take I-15 to Clairemont Mesa Blvd. Go west on Clairemont Mesa Blvd. one mile to Complex Street - turn right. Complex Street curves to the left and turns into Topaz Way. The MWD building and main parking lot are on the right but if you continue about a half a block (just before Kearny Villa Road), there is another parking lot on the left.

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN DIEGO REGION

9771 Clairemont Mesa Boulevard, Suite A
San Diego, California 92124-1324

Information: (858) 467-2952
CALNET: (8) 734-2952

BOARD MEMBERS	CITY OF RESIDENCE	APPOINTMENT CATEGORY
Wayne Baglin - Chair	Laguna Beach	Municipal Government
Thomas B. Day - Vice Chair	San Diego	Undesignated Public
Frank Piersall	San Diego	Industrial Water Users
Laurie Black	San Diego	Water Quality
John Minan	San Diego	Water Quality
Janet Keller	Laguna Beach	Recreation/Wildlife
Vacant		Water Supply
Vacant		County Government
Vacant		Irrigated Agriculture

Executive Staff
John H. Robertus, *Executive Officer*
Arthur L. Coe, *Assistant Executive Officer*
Lori Costa, *Executive Assistant*

State Board Staff Counsel
John Richards

State Board Member Liaison
Pete Silva

WATERSHED BRANCH
ichael McCann, *Supervising Engineer*

Watershed Protection Northern Region
Robert Morris, *Sr. Water Resource Control Engineer*
Rosalind Dimenstein, *Associate WRC Engineer*
Stacey Baczkowski, *Environmental Specialist III*
David Gibson, *Environmental Specialist III*
Elizabeth Lair, *Environmental Specialist II*
Christopher Means, *Environmental Specialist I*

Watershed Protection Southern Region
Mark Alpert, *Senior Engineering Geologist*
Kristin Schwall, *Assoc. Water Resource Control Engr*
Dat Quach, *Associate Water Resource Control Engr*
Cynthia Gorham-Test, *Environmental Specialist III*
Phil Hammer, *Environmental Specialist III*
Jane Ledford, *Environmental Specialist II*

Compliance Assurance
Frank Melbourn, *Assoc Water Resource Control Engr*
Rebecca Stewart, *Sanitary Engineering Associate*

Publicly Owned Treatment Works Compliance
Brian Kelly, *Senior WRC Engineer*
Todd Stanley, *Water Resource Control Engineer*
hiara Clemente, *Environmental Specialist II*
ictor Vasquez, *Water Resource Control Engineer*
Mona Dougherty, *Water Resource Control Engineer*
Robert Baker, *Retired Annuitant*

Industrial Compliance
John Phillips, *Senior WRC Engineer*
Paul Richter, *Associate Water Resource Control Engr*
Hashim Navrozali, *Water Resource Control Engineer*
Dan Phares, *Water Resource Control Engineer*
Whitney Ghoram, *Sanitary Engineering Associate*
Gloria Fulton, *Sanitary Engineering Associate*
Don Perrin, *Retired Annuitant*

Marine Waters
Peter Michael, *Environmental Specialist IV*

Inland Surface Waters
Greig Peters, *Environmental Specialist IV*

Watershed Management Coordinator
Bruce Posthumus, *Senior WRC Engineer*

WATER RESOURCE PROTECTION BRANCH
David Barker, Supervising Engineer

Land Discharge Unit
John Odermatt, *Senior Engineering Geologist*
Carol Tamaki, *Assoc. Water Resource Control Engr*
Brian McDaniel, *Associate Engineering Geologist*
Craig Carlisle, *Associate Engineering Geologist*
Amy Fortin, *Engineering Geologist*

Site Mitigation & Cleanup Unit
John Anderson, *Senior Engineering Geologist*
Charles Cheng, *Associate Engineering Geologist*
Vacancy, *Associate Engineering Geologist*
Laurie Walsh, *Water Resource Control Engineer*
Peter Peuron, *Environmental Specialist III*

Tank Site Mitigation & Cleanup Unit
Julie Chan, *Senior Engineering Geologist*
Corey Walsh, *Associate Engineering Geologist*
Sue Pease, *Environmental Specialist III*
Jody Ebsen, *Engineering Geologist*
Kelly Dorsery, *Engineering Geologist*

Water Quality Standards Unit
Deborah Jayne, *Supv. Environmental Specialist IV*
Linda Pardy, *Environmental Specialist III*
Alan Monji, *Environmental Specialist III*
Lisa Brown, *Environmental Specialist III*
Lesley Dobalian, *Environmental Specialist II*
Tom Alo, *Water Resource Control Engineer*
Kyle Olewnik, *Water Resource Control Engineer*

International Border Activities
Vicente Rodriguez, *Water Resource Control Engineer*

Information Systems Management
Bob Rossi, *Staff Information Systems Analyst*

Business Support Services Unit
Vacant, *Regional Administrative Officer*

Information Management
Rina Dalyot, *Information Systems Technician*
Michael Gallina, Office Assistant

Administrative Support Services
Diane Welch, *Staff Services Analyst*
Vacancy, *Staff Services Analyst*
Denise Smith, *Office Technician*
Equilla Harris, *Office Technician*

Revised 9/22/00

State of California

Memorandum

To : Mr. John Robertus, Executive Officer
San Diego Regional Water Quality Control Board
9771 Clairemont Mesa Blvd, Suite A
San Diego, CA 92124-1331

Date : October 13, 2000

SAN DIEGO REGIONAL WATER QUALITY CONTROL BOARD
2000 OCT 16 P 12: 18

From : **Department of Fish and Game**

Subject : Comments for Consideration on Resolution Nos. 2000-122 and 2000-123 that Establish Shipyard Sediment Cleanup Levels for Southwest Marine Inc. and National Steel and Shipbuilding Co. (NASSCO) and Corresponding Staff Report Dated October 6, 2000

Department of Fish and Game (Department) staff have reviewed the subject resolutions and corresponding staff report that identify several options being considered for the determination of sediment cleanup levels at Southwest Marine Inc. and NASSCO Shipyards located on San Diego Bay. The Department received the revised staff report on October 10, 2000. We understand that the deadline for the submission of comments has been extended to October 19, 2000. It should be noted that the Department has previously commented on this subject in a memorandum to you dated March 24, 1999. The Department again wishes to state that we are in complete agreement that cleanup of contaminated sediments at Southwest Marine Inc. and NASSCO is vital to the protection of fish and wildlife resources found in San Diego Bay. We appreciate the Shipyard's willingness to voluntarily clean up the contaminated sediments at their respective facilities. However, before the shipyards embark on this very necessary and costly effort, the Department believes that cleanup levels identified by some of the options in the staff report are questionable and need to be modified.

It is our understanding that the use of site-specific Apparent Effects Threshold (AETs) limits developed for the Campbell Shipyard are still being considered as part of Option 4 (p. 38-40) in the revised staff report. Although Option 4 includes additional monitoring, it is our continued opinion that sediment cleanup levels established at 810 parts per million (ppm) for copper, 820 ppm for zinc, 231 ppm for lead, 4.2 ppm for mercury, and 0.95 ppm for polychlorinated biphenyls (PCBs) are not sufficiently protective of fish and wildlife resources found in San Diego Bay. Option 3 is also problematic because it utilizes the Campbell Shipyard AETs as a baseline, then builds in an arbitrary 20% safety factor to reduce the cleanup levels. No scientific justification for the 20% safety factor is given in the report. Cleanup levels for copper, lead, zinc, and PCBs were developed for Campbell Shipyard in the early 1990s, and the mercury cleanup level was developed for a site in Commercial Basin (now known as America's Cup Harbor) in San Diego Bay. According to the provisions of Cleanup and Abatement Order No. 95-21, issued for the Campbell Shipyard, the AETs identified for Campbell were to be used only at the Campbell site, and Order No. 95-21 strictly prohibited their use anywhere else in San Diego Bay. In addition, the data used to develop the Campbell AETs included sites that showed toxicity. Toxicity was also shown at the Commercial Basin site.

Our concern for these cleanup levels stems not only from our review of the Campbell and Commercial Basin studies, but also from new information that has become available since the AETs for these sites were established In our previous correspondence dated March 24, 1999, the Department provided tables of data from the Bay Protection and Toxics Hot Spot (BPTHS) Program that summarized statewide sediment data on copper, zinc, lead, mercury, and PCBs.

The BPTHS data was collected after the Campbell study and includes information from several sites within San Diego Bay. The BPTHS data indicate that several sites around California had concentrations of copper above 400 ppm, zinc above 630 ppm, lead above 171ppm, mercury above 1.54, and PCBs above 0.865 ppm. Sites that had sediment at these concentrations were classified as being in the top 5% worst sites in the State and were associated with acute toxicity. For copper, 86% of the samples at 400 ppm or above showed acute toxicity. Acute toxicity percentages for lead at 171 ppm was 89%, for zinc at 630 ppm - 74% acute toxicity, for mercury at 1.54ppm - 59% acute toxicity, and PCBs at 0.95 ppm - 63% acute toxicity. It should be noted that the same amphipod test was utilized to determine toxicity for both the Campbell study and the BPTHS study. Most importantly, the cleanup levels proposed in Option 3 and Option 4 are significantly higher than the top 5 % worst sites in California and would be acutely toxic to benthic organisms.

Additional justification for our concerns can be found in screening guidelines produced by the National Oceanic and Atmospheric Agency (NOAA). These guidelines identify AETs for copper (390 ppm), zinc (410 ppm), mercury (0.41 ppm) and PCBs (0.130 ppm). We note that the NOAA AETs for these constituents are also well below those that would be established by implementing Options 3 or 4. Lastly, the State of Washington has recently passed legislation that establishes cleanup criteria based on AETs for Puget Sound. All of the Puget Sound AETs are well below those identified in Options 3 and 4.

In addition to the above information, it should be noted that your own agency's peer review process determined that the use of the Campbell AETs was not appropriate. Additionally, the staff report indicates that the chemical composition of the sediments at the three shipyards is significantly different when they are compared to each other (p.26, Table 4). The staff report goes on to state that " Because of the high percentages (60%-90%) of the significant differences observed in the analyses, the use of Campbell Shipyard's AET values as sediment cleanup values at NASSCO and Southwest Marine may not be appropriate." (p. 26).

Given the above information, the Department believes that the sediment cleanup levels identified in Options 3 and 4 would not be protective of the beneficial uses established for San Diego Bay. We strongly urge the Regional Water Quality Control Board to consider Option 1 (cleanup to background) or Option 5 (development of site-specific cleanup levels for Southwest Marine and NASSCO) as the most reliable and protective measures for the fish and wildlife resources that utilize San Diego Bay. If Option 5 is chosen, the Department requests that we be allowed to participate in the effort to develop the site-specific cleanup levels for these two facilities. With respect to Option 2, which identifies the use of the NOAA Effects Range Median (ERMs) sediment guidelines as the appropriate cleanup levels, our concerns are similar to those identified in your staff report. ERMs were not meant to be used as criteria, but rather as a screening tool.

The Department hopes that the ongoing process will produce sediment cleanup levels that are truly protective of the fish and wildlife resources that utilize San Diego Bay, and we appreciate the opportunity to review and comment upon the proposed project. As always, Department personnel are available to discuss our concerns, comments, and recommendations in further detail. To arrange for discussion, please contact Mr. William Paznokas, Environmental Specialist, 4949 Viewridge Ave., San Diego, CA 92123, telephone (619) 467-4218.

Robert N. Tasto

Robert N. Tasto, Supervisor
Project Review and Water Quality Program
Marine Region

cc: Mr. William Paznokas
Department of Fish and Game
San Diego, California

Ms. Patty Wolf, Regional Manager
Marine Region
Department of Fish and Game
Los Alamitos, California

November 6, 2000

TO: Vincente Rodriguez, Alan Monji, Tom Alo, CRWQCB-San Diego Region

FROM: Brett Betts, Washington Department of Ecology, Sediment Management Unit

SUBJECT: Comments on Regional Board Report Final Sediment Cleanup Levels NASSCO & Southwest Marine Shipyards San Diego Bay - California Regional Water Quality Control Board San Diego Region

I have reviewed the subject report and have the following general and specific comments. Feel free to email or call me if you have any questions regarding my comments.

General Comments

1. **Human Health.** In my review, I didn't see much information on relating human health risk to sediment concentrations. This routinely requires development of a site-specific biota to sediment accumulation factor (BSAF) to relate tissue concentrations that represent the range of acceptable risk to humans with a sediment concentration for the chemical(s) of concern. If a BSAF cannot be developed, tissue levels can be regulated/monitored to protect human health. I have provided specific comments below on particular chemicals of concern and Ecology's experience on development of human health protection levels.

2. **Apparent Effects Threshold values.** There is no documentation provided on your development activities regarding AETs in the past, and so its difficult to provide any comment on their strength and usability. I believe you know that Ecology recently proposed revisions to the AET method for development of sediment criteria in 1999. These changes regarded identification of outliers and reference stations and represent upgrades based on use of best available scientific methods. Tom Gries is a good contact for more information.

3. **Recontamination potential.** In the pros and cons discussion on each alternative, there was little information on recontamination potential and only a brief analysis of natural recovery via SEDCAM. For your information, Ecology views this model as simplistic and generally unacceptable for final recontamination potential evaluations. Ecology recommends use of the Water Quality Analysis Simulation Program (WASP5) to evaluate recontamination potential. For your information, we do consider recontamination potential and natural recovery evaluations to have different purposes although they may use some of the same information.

4. **Larval testing.** Ecology uses larval sediment bioassays for sediment biological testing including the following oyster, mussel, sand dollar and sea urchin species: Crassostrea gigas, Mytilus edulis, Dendraster excentricus and Stronglyocentrotus purpuratus and S. droebachiensis, respectively.

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this update of the SMS rule was never adopted, it represents our best thinking on requirements for sediment cleanup studies. This draft improves on the language and content currently contained in the adopted 1995 SMS rule.

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Specific Comments

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at the Puget Sound Naval Shipyard (regulated to 90% Puget Sound reference quality) and for Mercury at 1.2 ppm (dry) in Bellingham Bay, using risk assessment and a regression analysis between local crab tissue and sediment concentrations to identify the sediment cleanup level.

4. Page 21, Peer Review Panel and comments. While the peer review panel was apparently chosen on the basis of "professional experience and reputation concerning bay sediment analysis, and benthic chemistry and toxicity," their experience and knowledge on development and use of the AET methodology was not identified. I am not aware that any of these individuals would be considered an AET expert, much less supportive of the development and use of AETs. Perhaps your review of their qualifications or Tom Gries' knowledge of these scientists supports continued consideration of these scientists as AET experts.

I didn't take the time to review Appendix B on your webpage, but I have the following comments:

Steve Bay – Contamination patterns are different therefore use of the AETs are not appropriate. This comment addresses the robustness of the dataset used to establish the Campbell Shipyard AETs, i.e., 15 stations, and because this dataset is low in number, the AETs may represent site-specific conditions only. Of course, contamination "patterns" are primarily affected by discharge characteristics and physical forces in the receiving water. What I believe Mr. Bay is referring to is the range of chemical contamination seen in the two different locations and whether they are significantly different. If they are different, then the reliability of a particular chemical AET does come into question. While I strongly support your efforts to develop and use AET values for sediment management, Ecology has not used AETs based on less than 50 stations to regulate site-specific cleanup. This does not mean you can't use your 15 station AET values, but that you must accept that there is higher uncertainty with their use. This means that not only could the AETs you have developed change significantly, but also that additional AETs, e.g., mussel, could be substantially more sensitive and drive potential cleanup values to far more stringent levels.

Insufficient data support the AET values' reliability. See my general comment regarding your AET development activities. Were reliability analyses completed?

Russel Fairey – The Campbell Shipyard dataset is insufficient and unsuitable for application of the AET approach. This is a pretty interesting comment and my thoughts on quantity of data are identified above. Regarding unsuitability, in Puget Sound a very limited amount of data was rejected as unsuitable for AET development, primarily due to matrix effects. So, while "unsuitability" is not unheard of, it is certainly not very common and I would be very interested in the specifics of Mr. Fairey's rationale regarding this comment.

The shipyards physical, chemical and biological data are not similar enough. Its interesting to note that Mr. Todd Thornburg's comments were exactly opposite. These kinds of physical analyses are easy to complete and I see by your responses later in the report you consider the sediments similar.

Cleanup levels using an AET approach do not provide the level of environmental protection for the management area. I assume Mr. Fairey is commenting on the sensitivity of the AETs that were developed at Campbell Shipyard, and I would agree that more sensitive AETs may be developed. Given the apparent mandate to protect to background levels, this is an appropriate comment suggesting that the existing AETs may not be stringent enough. The reliability analyses could help answer this question also.

Todd Thornburg - Sediments exhibit low toxicity. This could really speak to the need for additional biological tests, e.g., larval species that may be more sensitive to the chemicals of concern. It also appears none of the peer reviewers commented on human health issues?

Campbell Shipyards AETs are consistent with sediment management standards. I am interested in whose sediment management standards Mr. Thornburg is referring to, as there are some differences from Ecology's sediment management standards, e.g., mercury and PCBs.

5. Page 23, last paragraph. I understand why you recommend the need for an additional biological test, but recommend caution regarding your language "A less desirable alternative is to rely on a total benthic infauna abundance study as the additional test." Often we characterize the goal as to protect benthos and human health, and therefore it is counterintuitive to say benthic analyses is less desirable. I assume you are speaking to the sensitivity of the total abundance endpoint and I as state above, there may well be more sensitive benthic endpoints. In any case, recommend you word this response carefully to distinguish the issue and your rationale clearly.

6. Page 24, Grain size. The discussion here could be improved by some reference to actual ranges of grain size and TOC evaluated, rather than just referring to the statistical test results, i.e., let the reader evaluate the ranges. Maybe this information was in Appendix C, which I didn't review.

7. Page 25/26, Tables 3 and 4. These kind of comparisons make me wonder about what the range of contaminant levels were in the separate locations and which values were used in the statistical evaluations, i.e., means, median, geometric mean. These type analyses often say more about the statistical methods used, than the actual data compared. Some review and discussion of the individual and composite datasets for normality/homogeneity would help the reader too.

8. Page 27, Paragraph 1. Assume you meant "quantity of acid volatile **sulfides**."

Paragraph 2. The last sentence suggests diversity measures were analyzed. Are results from diversity endpoint measurements available? If so, recommend they be discussed in the report.

Last paragraph. "The AET approach has been used throughout the country..." I'd be interested in your information supporting this claim for strictly selfish reasons. You also recommend cleanup levels can be set at more stringent levels to block for "uncertainties in the data" later on in this paragraph. Which uncertainties are your referring to and why are they important?

9. Page 28, Evaluation of Most Sensitive Beneficial Use, paragraph 2. This states the overt assumption that the benthic community represents the most sensitive beneficial use needing protection from contaminated sediments. In Washington State, human health often sets the most sensitive beneficial use for sediment contamination from PCBs and PAH compounds. Is consideration of human health included in this stated assumption?

10. Page 30, Evaluation of Most Sensitive Beneficial Use, last paragraph. Although site-specific bioaccumulation testing is wise, I assume this just addresses laboratory bioaccumulation tests, not field collected tissue samples. Will field tissue samples be collected? Of course, the difficulty here with human health assessments, is to relate any tissue levels to sediment cleanup levels and post-cleanup monitoring programs. Has any consideration been given to development of BSAF values? How will sediment cleanup values be identified to protect for human health risks?

11. Page 32, Background Reference Stations. This discussion was pretty difficult to understand without having the supporting analyses in Appendix E, which I didn't take the time to review. Ecology defines background differently from reference. We use background as essentially a localized ambient sediment quality condition often used in the context of sediment quality conditions upcurrent/upstream from a particular

discharge; as I often say to determine if one discharger's peanut butter (sediment contaminant) is contaminating another discharger's chocolate (sediment quality condition). Ecology uses reference stations primarily for bioassay testing and they represent a pristine, non-anthropogenically contaminated sediment quality condition which is characteristic of a site-specific sediment quality for grain size, TOC and other chemical and physical attributes.

We never use the term "background reference" but I believe you mean a localized reference condition. And I'm not sure we would endorse the use of the chemical comparisons in the manner that they were conducted, but its pretty hard to understand what was done by just reading this paragraph.

Our reference stations do have "natural" levels of heavy metals, and also levels of PCBs; PCBs are ubiquitous throughout Puget Sound. But we generally state that reference stations should be well removed from any source of human-caused sediment contamination. I will send you a copy of the 1991 Reference Area Performance Standards for Puget Sound by mail, but have itemized key maximum contaminant levels recommended in the report (Attachment 1). These chemical values represent the 90th percentile by distribution of chemical concentrations found in acceptable reference embayments in Puget Sound. Of course, no reference sediment may exhibit adverse biological effects in benthos or laboratory bioassays. Finally, your Table 6 values for PCBs and mercury strike me as unacceptably high.

Attachment 1

Recommended Reference Area Performance Standards - Maximum Allowable Chemical Contamination (Dry Weight) (Table 13 in Reference Area Performance Standards for Puget Sound)

Metals (mg/kg)

Arsenic-------------22
Cadmium-----------1.5
Chromium...........85
Copper--------------53
Lead-----------------20
Mercury------------0.15
Nickel--------------42
Silver---------------0.32
Zinc----------------103

Nonionic Organic Compounds (ug/kg)

LPAH--------------200
HPAH--------------330
Total PCBs--------47

Total Organic Carbon--2.5%

WAC 173-204-560 Cleanup study.

(1)Purpose. This section describes cleanup study plan and report standards which meet the intent of cleanup actions required under authority of chapter 90.48 and/or 70.105D RCW, and/or this chapter.

(2) Where a sediment cleanup action occurs under the authority of the chapter 70.105D RCW, the department shall consider compliance with the cleanup study requirements of this section as satisfying the remedial investigation/feasibility study requirements of Chapter 173-340 WAC. However, cleanup actions required under authority of chapter 70.105D RCW must also comply with applicable administrative procedures and public participation requirements associated with performing remedial investigations and feasibility studies. Where there are inconsistencies between this chapter and chapter 173-340 WAC for establishing site identification, site investigation and reporting, cleanup standards, remedies selection, and sampling and analysis, chapter 173-204 WAC shall govern.

(3) The cleanup study plan and report standards in this chapter include activities to collect, develop, and evaluate sufficient information to enable consideration of cleanup alternatives and selection of a site-specific sediment cleanup standard before making a cleanup decision. The cleanup study and report may be separate reports or combined, as approved by the department. Each person performing a cleanup action to meet the intent of this chapter shall submit a cleanup study plan and cleanup study report to the department for review and written approval before implementing any onsite sampling, investigation and cleanup action, except as identified in WAC 173-204-550(3)(d). The department may approve the cleanup study plan as submitted, may approve the cleanup study plan with appropriate changes or additions, or may require preparation of a new cleanup study plan.

(4) The scope of a cleanup study plan shall depend on the specific site informational needs, the site hazard, the type of cleanup action proposed, and the authority cited by the department to require clean up. In establishing the necessary scope of the cleanup study plan, the department may consider cost mitigation factors, such as the financial resources of the person(s) responsible for the cleanup action. In all cases sufficient information must be collected, developed, and evaluated to enable the appropriate selection of a cleanup standard under WAC 173-204-570 and a cleanup action decision under WAC 173-204-580. The sediment cleanup study plan shall address:

(a) Public information/education;

(b) Evaluation of site investigation and cleanup alternatives;

(c) Sampling plan and recordkeeping; and

(d) Site safety.

These cleanup study subjects may be included in one sediment cleanup study plan or be submitted as separate plans for review and approval by the department.

(5) The cleanup study plan shall encourage coordinated and effective public involvement commensurate with the nature of the proposed cleanup action, the level of public concern, and the existence of, or potential for adverse effects on biological resources and/or a threat to human health. The department may determine that public information and involvement programs conducted under other authorities or programs meet the intent of this subsection. The cleanup study plan shall address proposed activities for the following public information/education and participation subjects:

(a) When public notice will occur, the length of the comment periods accompanying each notice, establishment and maintenance of a mailing list of interested persons requesting notice, the potentially affected vicinity, and any other areas to be provided notice;

(b) Where public information repositories will be located to provide site information to the public;

(c) Methods for providing information to the public, such as, press releases, public meetings, fact sheets, etc.;

(d) Comment periods. All public notices shall indicate the public comment period on the proposed action. Unless stated otherwise, comment periods shall be for at least thirty days;

(e) Coordination of public participation requirements mandated by other federal, state, or local laws;

(f) Methods of identifying the public's concerns. The methods of identifying the public's concerns may include: interviews, questionnaires, meetings, contacts with community groups or other organizations which have an interest in the site, establishing a citizen advisory group for the site, or obtaining advice from an appropriate regional citizens' public advisory committee;

(g) Methods of addressing the public's concerns and conveying information, proposed alternatives and decisions to the public;

(h) Amendments to the planned public involvement activities; and

(i) Any other elements that the department determines to be appropriate for inclusion in the cleanup study plan.

(6) The content of the cleanup study plan for the site investigation and cleanup alternatives evaluation is determined by the type of cleanup action selected as defined under WAC 173-204-550. As determined appropriate by the department, the cleanup study plan shall report available information and address collection of additional necessary information for the following subjects:

(a) Introduction (general site information). The introduction shall clearly explain why the cleanup study is being performed and define the objectives of the study. The study introduction shall include general site information including but not limited to:

(i) Project title;

(ii) Name, address and phone number of the project proponent and coordinator; and

(iii) A legal description of the cleanup site.

(b) Site description, summary of existing information and collection of additional information. This section of the work plan shall provide a review of each category of information that was collected during the site hazard assessment stage. This summary shall report available information and address collection of additional necessary information for the following subjects:

(i) Identification of current and past legal ownership of the site and surrounding area;

(ii) Identification of past and present owners and operators of contaminant source discharges to the vicinity of the site; and

(iii) Characterization of sediment quality at the site and surrounding vicinity using available chemical, biological and risk assessment data;

(iv) Characterization of key site and surrounding area features and conditions including a map(s) to identify, where possible, the following features:

(A) Site and neighboring property boundaries;

(B) Associated shoreland surface topography and site subsurface bathymetry;

(C) Locations in the vicinity of the site that may be considered areas of special importance including:

(I) Spawning areas;

(II) Nursery areas;

(III) Waterfowl feeding areas;

(IV) Shellfish harvesting areas;

(V) Public fishing piers;

(VI) Areas used by species of economic importance;

(VII) Tribal areas of significance;

(VIII) Areas determined to be ecologically unique;

(IX) Water supply intake areas;

(X) Areas used for primary contact public recreation;

(XI) Waterbody locations that are listed under section 303d of the federal Clean Water Act;

(D) Surface and subsurface structures;

(E) Utility line locations and type;

(F) Location of existing or planned navigation lanes, channel markers or buoys;

(G) Current and ongoing point and nonpoint wastewater or stormwater discharges to the site and vicinity; and

(H) Other pertinent information determined necessary by the department.

(v) Area and volume dimensions, if known, or estimates of the site;

(vi)The site boundary defined by the individual contaminants exceeding the applicable sediment quality standards of WAC 173-204-320 through 173-204-340 at the point where the concentration of the contaminant would meet:

(A) The applicable sediment quality standards of WAC 173-204-320 through 173-204-340; and

(B) The applicable minimum cleanup level of WAC 173-204-520; and

(C) Recommended site-specific sediment cleanup standards of WAC 173-204-570.

(c) Project administration. Project administration, coordination and communication. This section of the cleanup study plan should provide information on the project coordinator's proposed coordination methods for task management, quality control, and communications with and between local, state and federal agencies, contractors, subcontractors, and laboratories.

(d) Site investigation. This section of the cleanup study plan shall describe the field investigation, sampling and analysis, and other site physical information collection activities that will take place during the study. The rationale and objectives for each activity shall be identified.

(i) Surface water and sediments. Investigations of surface water hydrodynamics and sediment transport mechanisms to characterize significant hydrologic features such as: Site surface water drainage patterns, quantities and flow rates, areas of sediment erosion and deposition including estimates of sedimentation rates, and actual or potential contaminant migration routes to and from the site and within the site. Sufficient surface water and sediment sampling shall be performed to adequately characterize the areal and vertical distribution and concentrations of contaminants. Recontamination potential of sediments which are likely to influence the type and rate of contaminant migration, or are likely to affect the ability to implement alternative cleanup actions shall be characterized;

(ii) Geology and ground water system characteristics. Investigations of site geology and hydrogeology to adequately characterize the physical properties and distribution of sediment types, and the characteristics of ground water flow rate, ground water gradient, ground water discharge areas, and ground water quality data which may affect site cleanup alternatives evaluations;

(iii) Climate. Information regarding local and regional climatological characteristics which are likely to affect surface water hydrodynamics, ground water flow characteristics, and migration of sediment contaminants such as: Seasonal patterns of rainfall; the magnitude and frequency of significant storm events; prevailing wind direction and velocity;

(iv) Chemical contamination of surface water, sediment and fish and shellfish tissue. Sufficient surface water, sediment and fish and shellfish sampling and analyses shall be conducted to adequately characterize the area and vertical distribution and quantity of chemical contamination.

Additionally, fish and/or shellfish tissue sampling and analyses shall be conducted to adequately complete risk assessments for chemical contaminant threats to human health and to characterize the site on the basis of human health threat.

(v) Biological effects from site sediments. Acute and chronic sediment toxicity testing using the confirmatory sediment biological tests identified in WAC 173-204-310 and the biological effects criteria stipulated in WAC 173-204-320(3) and 173-204-520(3), as appropriate, may be performed to confirm the results of chemical tests and to evaluate the interactive effects of multiple chemical contaminants at the site.

(vi) Characterization of sediments for potential removal. At a minimum, sediments that may be proposed for potential removal shall be chemically evaluated as follows:

(A) Areas that could be dredged as part of a cleanup action may be sampled using composited samples over depth at individual stations to characterize the chemical contamination; and

(B) The potential for sediment chemical contaminant mobility and loss in sediments proposed for removal shall be evaluated using elutriate, column leaching and column settling tests or other appropriate tests approved by the department.

(vii) Characterization of sediment fate and transport and natural recovery processes. Site physical, chemical and biological effects shall be evaluated to adequately characterize key factors responsible for the addition to or loss from chemical contaminant levels in site sediments. At a minimum, site sampling and testing shall include:

(A) Surface water current measurements at the water surface and sediment surface;

(B) Identification of surface sediment deposition and resuspension rates using Lead 210 dating and site sediment traps; and

(C) Other tests as determined by the department.

(viii) Land use. Information shall be collected to characterize human populations exposed or potentially exposed to sediment contaminants released from the site and present and proposed uses and zoning for shoreline areas contiguous with the site; and

(ix) Natural resources and ecology. Information shall be collected to determine the impact or potential impact of sediment contaminants from the site on natural resources and ecology of the area such as: Sensitive environment, local and regional habitat, plant and animal species, and other environmental receptors.

(e) Sediment contaminant sources. Sufficient information should be collected on all sources of contamination to site sediments to allow a determination of what source control activities must be performed to ensure the long-term success of site cleanup actions. A description of the location, quantity, areal and vertical extent, concentration and sources of active and inactive waste disposal and other sediment contaminant discharge sources which affect or potentially affect the site must be included. Where determined relevant by the department, the following information shall be obtained by the department from the responsible discharger:

(i) The physical and chemical characteristics, and the biological effects of site sediment contaminant sources;

(ii) The status of source control actions for permitted and unpermitted site sediment contaminant sources; and

(iii) A recommended compliance time frame for known permitted and unpermitted site sediment contaminant sources which affect or potentially affect implementation of the timing and scope of the site cleanup action alternatives.

(f) Data management and analysis. This section of the cleanup study shall describe how environmental and other data collected during the field investigation will be managed and analyzed.

(g) Human health risk assessment. This section of the cleanup study shall describe the techniques that will be used to perform human health risk assessments using data collected during the hazard assessment and during the field investigation. The current and potential threats to human health that may be posed by sediment site contamination shall be evaluated using a risk assessment procedure approved by the department. The human health risk assessment should include:

(i) Discussion of the relevance of available data to human exposure including a discussion of any confirmational fish/shellfish tissue data or bioaccumulation test results collected in conformance with WAC 173-204-310;

(ii) Documentation on the proposed use of site-specific exposure parameters established in conformance with WAC 173-204-520(4) ; and

(iii) Recommendations and rationale for site-specific cleanup standards for human health protection (WAC 173-204-570).

(h) Applicable state and federal laws and development of cleanup standards. This section of the cleanup study must present the methods and sources of information that will be used to identify applicable state and federal laws and criteria and the methods that will be used to develop proposed cleanup standards. For purposes of this chapter, the term "applicable state and federal laws" includes legally applicable requirements and relevant and appropriate requirements.

(i) Cleanup action alternatives. The cleanup study plan shall present the methods and sources of information that will be used to develop and evaluate the cleanup action alternatives for the site. A preliminary list of technologies to be considered in developing cleanup action alternatives must be presented, and the method that will be used to screen the technologies and combine them into cleanup action alternatives must be described. The cleanup study plan shall also describe the criteria that will be used to screen the technologies and combine them into cleanup action alternatives.

(j) The cleanup study plan shall describe the methods to used to comply with the State Environmental Policy Act.

(7) The cleanup study plan shall address proposed sampling and recordkeeping activities to meet the standards of WAC 173-204-600, Sampling and testing plan standards, and WAC 173-204-610, Records management, and the standards of this section.

(8) The cleanup study plan shall address proposed activities to meet the requirements of the Occupational Safety and Health Act of 1970 (29 U.S.C. Sec. 651 et seq.) and the Washington Industrial Safety and Health Act (chapter 49.17 RCW), and regulations promulgated under those acts. These requirements are subject to enforcement by the designated federal and state agencies. Actions taken by the department under this chapter do not constitute an exercise of statutory authority within the meaning of section (4)(b)(1) of the Occupational Safety and Health Act.

(9) In cases where the person(s) responsible for clean up is not able to secure access to sample sediments on lands subject to a cleanup study plan approved by the department, the department may facilitate negotiations or other proceedings to secure access to the lands. Requests for department facilitation of land access for sampling shall be submitted to the department in writing by the person(s) responsible for the cleanup action study plan.

November 6, 2000

TO: Vincente Rodriguez, Alan Monji, Tom Alo, CRWQCB-San Diego Region
FROM: Brett Betts, Washington Department of Ecology, Sediment Management Unit
SUBJECT: Comments on Regional Board Report Final Sediment Cleanup Levels NASSCO & Southwest Marine Shipyards San Diego Bay - California Regional Water Quality Control Board San Diego Region

I have reviewed the subject report and have the following general and specific comments. Feel free to email or call me if you have any questions regarding my comments.

General Comments

1. **Human Health.** In my review, I didnÁt see much information on relating human health risk to sediment concentrations. This routinely requires development of a site-specific biota to sediment accumulation factor (BSAF) to relate tissue concentrations that represent the range of acceptable risk to humans with a sediment concentration for the chemical(s) of concern. If a BSAF cannot be developed, tissue levels can be regulated/monitored to protect human health. I have provided specific comments below on particular chemicals of concern and EcologyÁs experience on development of human health protection levels.

2. **Apparent Effects Threshold values.** There is no documentation provided on your development activities regarding AETs in the past, and so its difficult to provide any comment on their strength and usability. I believe you know that Ecology recently proposed revisions to the AET method for development of sediment criteria in 1999. These changes regarded identification of outliers and reference stations and represent upgrades based on use of best available scientific methods. Tom Gries is a good contact for more information.

3. **Recontamination potential.** In the pros and cons discussion on each alternative, there was little information on recontamination potential and only a brief analysis of natural recovery via SEDCAM. For your information, Ecology views this model as simplistic and generally unacceptable for final recontamination potential evaluations. Ecology recommends use of the Water Quality Analysis Simulation Program (WASP5) to evaluate recontamination potential. For your information, we do consider recontamination potential and natural recovery evaluations to have different purposes although they may use some of the same information.

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I was pretty surprised and dismayed to see your documentation of ten years of effort for the subject sites. Did sediment investigations proceed? Its not clear if they were started or completed by the companies involved or by the state. Adding some documentation to the timeline regarding site investigation work could be helpful to the unknowing reader.

3. Page 19, last paragraph, page 20, first and fourth paragraphs. This discussion regarding bioaccumulation of arsenic, mercury, butyltin species and PCBs in tissues is significant. These results were apparently discounted as within the range of concentrations reported in fish from other locations in San Diego Bay. I recommend some reconsideration of whether San Diego Bay tissue levels are at levels that represent a threat to human health. The mercury levels AET recommended in the Shelter Island Boatyard discussion strike me as extremely high and potentially insensitive to tissue accumulation/human health risk issues. For your information, Ecology has regulated sediment cleanups in Puget Sound sediments based on human health concerns for PCBs at 1.2 ppm (TOC) at the Puget Sound Naval Shipyard (regulated to 90% Puget Sound reference quality)

and for Mercury at 1.2 ppm (dry) in Bellingham Bay, using risk assessment and a regression analysis between local crab tissue and sediment concentrations to identify the sediment cleanup level.

4. Page 21, Peer Review Panel and comments. While the peer review panel was apparently chosen on the basis of ‰professional experience and reputation concerning bay sediment analysis, and benthic chemistry and toxicity,Â their experience and knowledge on development and use of the AET methodology was not identified. I am not aware that any of these individuals would be considered an AET expert, much less supportive of the development and use of AETs. Perhaps your review of their qualifications or Tom GriesÁ knowledge of these scientists supports continued consideration of these scientists as AET experts.

I didnÁt take the time to review Appendix B on your webpage, but I have the following comments:

Steve Bay - Contamination patterns are different therefore use of the AETs are not appropriate. This comment addresses the robustness of the dataset used to establish the Campbell Shipyard AETs, i.e., 15 stations, and because this dataset is low in number, the AETs may represent site-specific conditions only. Of course, contamination ‰patternsÂ are primarily affected by discharge characteristics and physical forces in the receiving water. What I believe Mr. Bay is referring to is the range of chemical contamination seen in the two different locations and whether they are significantly different. If they are different, then the reliability of a particular chemical AET does come into question. While I strongly support your efforts to develop and use AET values for sediment management, Ecology has not used AETs based on less than 50 stations to regulate site-specific cleanup. This does not mean you canÁt use your 15 station AET values, but that you must accept that there is higher uncertainty with their use. This means that not only could the AETs you have developed change significantly, but also that additional AETs, e.g., mussel, could be substantially more sensitive and drive potential cleanup values to far more stringent levels.

Insufficient data support the AET valuesÁ reliability. See my general comment regarding your AET development activities. Were reliability analyses completed?

Russel Fairey - The Campbell Shipyard dataset is insufficient and unsuitable for application of the AET approach. This is a pretty interesting comment and my thoughts on quantity of data are identified above. Regarding unsuitability, in Puget Sound a very limited amount of data was rejected as unsuitable for AET development, primarily due to matrix effects. So, while ‰unsuitabilityÂ is not unheard of, it is certainly not very common and I would be very interested in the specifics of Mr. FaireyÁs rationale regarding this comment.

The shipyards physical, chemical and biological data are not similar enough. Its interesting to note that Mr. Todd ThornburgÁs comments were exactly opposite. These kinds of physical analyses are easy to complete and I see by your responses later in the report you consider the sediments similar.

Cleanup levels using an AET approach do not provide the level of environmental protection for the management area. I assume Mr. Fairey is commenting on the sensitivity of the AETs that were developed at Campbell Shipyard, and I would agree that more sensitive AETs may be developed. Given the apparent mandate to protect to background levels, this is an appropriate comment suggesting that the existing AETs may not be stringent enough. The reliability analyses could help answer this question also.

Todd Thornburg - Sediments exhibit low toxicity. This could really speak to the need for additional biological tests, e.g., larval species that may be more sensitive to the chemicals of concern. It also appears none of the peer reviewers commented on human health issues?

Campbell Shipyards AETs are consistent with sediment management standards. I am interested in whose sediment management standards Mr. Thornburg is referring to, as there are some differences from EcologyÁs sediment management standards, e.g., mercury and PCBs.

5. Page 23, last paragraph. I understand why you recommend the need for an additional biological test, but recommend caution regarding your language ‰A less desirable alternative is to rely on a total benthic infauna abundance study as the additional test.Â Often we characterize the goal as to protect benthos and human health, and therefore it is counterintuitive to say benthic analyses is less desirable. I assume you are speaking to the sensitivity of the total abundance endpoint and I as state above, there may well be more sensitive benthic endpoints. In any case, recommend you word this response carefully to distinguish the issue and your rationale clearly.

6. Page 24, Grain size. The discussion here could be improved by some reference to actual ranges of grain size and TOC evaluated, rather than just referring to the statistical test results, i.e., let the reader evaluate the ranges. Maybe this information was in Appendix C, which I didnÁt review.

7. Page 25/26, Tables 3 and 4. These kind of comparisons make me wonder about what the range of contaminant levels were in the separate locations and

which values were used in the statistical evaluations, i.e., means, median, geometric mean. These type analyses often say more about the statistical methods used, than the actual data compared. Some review and discussion of the individual and composite datasets for normality/homogeneity would help the reader too.

8. Page 27, Paragraph 1. Assume you meant ‰quantity of acid volatile **sulfides**.Â

Paragraph 2. The last sentence suggests diversity measures were analyzed. Are results from diversity endpoint measurements available? If so, recommend they be discussed in the report.

Last paragraph. ‰The AET approach has been used throughout the countryÿÂ IÁd be interested in your information supporting this claim for strictly selfish reasons. You also recommend cleanup levels can be set at more stringent levels to block for ‰uncertainties in the dataÂ later on in this paragraph. Which uncertainties are your referring to and why are they important?

9. Page 28, Evaluation of Most Sensitive Beneficial Use, paragraph 2. This states the overt assumption that the benthic community represents the most sensitive beneficial use needing protection from contaminated sediments. In Washington State, human health often sets the most sensitive beneficial use for sediment contamination from PCBs and PAH compounds. Is consideration of human health included in this stated assumption?

10. Page 30, Evaluation of Most Sensitive Beneficial Use, last paragraph. Although site-specific bioaccumulation testing is wise, I assume this just addresses laboratory bioaccumulation tests, not field collected tissue samples. Will field tissue samples be collected? Of course, the difficulty here with human health assessments, is to relate any tissue levels to sediment cleanup levels and post-cleanup monitoring programs. Has any consideration been given to development of BSAF values? How will sediment cleanup values be identified to protect for human health risks?

11. Page 32, Background Reference Stations. This discussion was pretty difficult to understand without having the supporting analyses in Appendix E, which I didnÁt take the time to review. Ecology defines background differently from reference. We use background as essentially a localized ambient sediment quality condition often used in the context of sediment quality conditions upcurrent/upstream from a particular discharge; as I often say to determine if one dischargerÁs peanut butter (sediment contaminant) is contaminating another dischargerÁs chocolate (sediment quality condition). Ecology uses reference stations primarily for bioassay testing and they represent a pristine, non-

anthropogenically contaminated sediment quality condition which is characteristic of a site-specific sediment quality for grain size, TOC and other chemical and physical attributes.

We never use the term ‰background referenceÂ but I believe you mean a localized reference condition. And IÁm not sure we would endorse the use of the chemical comparisons in the manner that they were conducted, but its pretty hard to understand what was done by just reading this paragraph.

Our reference stations do have ‰naturalÂ levels of heavy metals, and also levels of PCBs; PCBs are ubiquitous throughout Puget Sound. But we generally state that reference stations should be well removed from any source of human-caused sediment contamination. I will send you a copy of the 1991 Reference Area Performance Standards for Puget Sound by mail, but have itemized key maximum contaminant levels recommended in the report (Attachment 1). These chemical values represent the 90th percentile by distribution of chemical concentrations found in acceptable reference embayments in Puget Sound. Of course, no reference sediment may exhibit adverse biological effects in benthos or laboratory bioassays. Finally, your Table 6 values for PCBs and mercury strike me as unacceptably high.

Attachment 1

Recommended Reference Area Performance Standards - Maximum Allowable Chemical Contamination (Dry Weight)
(Table 13 in Reference Area Performance Standards for Puget Sound)

Metals (mg/kg)
Arsenic-------------22
Cadmium-----------1.5
Chromiumÿÿÿÿ85
Copper--------------53
Lead-----------------20
Mercury------------0.15
Nickel--------------42
Silver---------------0.32
Zinc----------------103

Nonionic Organic Compounds (ug/kg)
LPAH--------------200
HPAH--------------330
Total PCBs--------47

Total Organic Carbon--2.5%

Attachment 2 - Draft SMS rule language

WAC 173-204-560 Cleanup study.

(1)Purpose. This section describes cleanup study plan and report standards which meet the intent of cleanup actions required under authority of chapter 90.48 and/or 70.105D RCW, and/or this chapter.

(2) Where a sediment cleanup action occurs under the authority of the chapter 70.105D RCW, the department shall consider compliance with the cleanup study requirements of this section as satisfying the remedial investigation/feasibility study requirements of Chapter 173-340 WAC. However, cleanup actions required under authority of chapter 70.105D RCW must also comply with applicable administrative procedures and public participation requirements associated with performing remedial investigations and feasibility studies. Where there are inconsistencies between this chapter and chapter 173-340 WAC for establishing site identification, site investigation and reporting, cleanup standards, remedies selection, and sampling and analysis, chapter 173-204 WAC shall govern.

(3) The cleanup study plan and report standards in this chapter include activities to collect, develop, and evaluate sufficient information to enable consideration of cleanup alternatives and selection of a site-specific sediment cleanup standard before making a cleanup decision. The cleanup study and report may be separate reports or combined, as approved by the department. Each person performing a cleanup action to meet the intent of this chapter shall submit a cleanup study plan and cleanup study report to the department for review and written approval before implementing any onsite sampling, investigation and cleanup action, except as identified in WAC 173-204-550(3)(d). The department may approve the cleanup study plan as submitted, may approve the cleanup study plan with appropriate changes or additions, or may require preparation of a new cleanup study plan.

(4) The scope of a cleanup study plan shall depend on the specific site informational needs, the site hazard, the type of cleanup action proposed, and the authority cited by the department to require clean up. In establishing the necessary scope of the cleanup study plan, the department may consider cost mitigation factors, such as the financial resources of the person(s) responsible for the cleanup action. In all cases sufficient information must be collected, developed, and evaluated to enable the appropriate selection of a cleanup standard under WAC 173-204-570 and a cleanup action decision under WAC 173-204-580. The sediment cleanup study plan shall address:

(a) Public information/education;

(b) Evaluation of site investigation and cleanup alternatives;

(c) Sampling plan and recordkeeping; and
(d) Site safety.

These cleanup study subjects may be included in one sediment cleanup study plan or be submitted as separate plans for review and approval by the department.

(5) The cleanup study plan shall encourage coordinated and effective public involvement commensurate with the nature of the proposed cleanup action, the level of public concern, and the existence of, or potential for adverse effects on biological resources and/or a threat to human health. The department may determine that public information and involvement programs conducted under other authorities or programs meet the intent of this subsection. The cleanup study plan shall address proposed activities for the following public information/education and participation subjects:

(a) When public notice will occur, the length of the comment periods accompanying each notice, establishment and maintenance of a mailing list of interested persons requesting notice, the potentially affected vicinity, and any other areas to be provided notice;

(b) Where public information repositories will be located to provide site information to the public;

(c) Methods for providing information to the public, such as, press releases, public meetings, fact sheets, etc.;

(d) Comment periods. All public notices shall indicate the public comment period on the proposed action. Unless stated otherwise, comment periods shall be for at least thirty days;

(e) Coordination of public participation requirements mandated by other federal, state, or local laws;

(f) Methods of identifying the publicÁs concerns. The methods of identifying the publicÁs concerns may include: interviews, questionnaires, meetings, contacts with community groups or other organizations which have an interest in the site, establishing a citizen advisory group for the site, or obtaining advice from an appropriate regional citizensÁ public advisory committee;

(g) Methods of addressing the publicÁs concerns and conveying information, proposed alternatives and decisions to the public;

(h) Amendments to the planned public involvement activities; and

(i) Any other elements that the department determines to be appropriate for inclusion in the cleanup study plan.

(6) The content of the cleanup study plan for the site investigation and cleanup alternatives evaluation is determined by the type of cleanup action selected as defined under WAC 173-204-550. As determined appropriate by the department, the cleanup study plan shall report available information and address collection of additional necessary information for the following subjects:

(a) Introduction (general site information). The introduction shall clearly explain why the cleanup study is being performed and define the objectives of the study. The study introduction shall include general site information including but not limited to:

(i) Project title;

(ii) Name, address and phone number of the project proponent and coordinator; and

(iii) A legal description of the cleanup site.

(b) Site description, summary of existing information and collection of additional information. This section of the work plan shall provide a review of each category of information that was collected during the site hazard assessment stage. This summary shall report available information and address collection of additional necessary information for the following subjects:

(i) Identification of current and past legal ownership of the site and surrounding area;

(ii) Identification of past and present owners and operators of contaminant source discharges to the vicinity of the site; and

(iii) Characterization of sediment quality at the site and surrounding vicinity using available chemical, biological and risk assessment data;

(iv) Characterization of key site and surrounding area features and conditions including a map(s) to identify, where possible, the following features:

(A) Site and neighboring property boundaries;

(B) Associated shoreland surface topography and site subsurface bathymetry;

(C) Locations in the vicinity of the site that may be considered areas of special importance including:

(I) Spawning areas;

(II) Nursery areas;

(III) Waterfowl feeding areas;

(IV) Shellfish harvesting areas;

(V) Public fishing piers;

(VI) Areas used by species of economic importance;

(VII) Tribal areas of significance;

(VIII) Areas determined to be ecologically unique;

(IX) Water supply intake areas;

(X) Areas used for primary contact public recreation;

(XI) Waterbody locations that are listed under section 303d of the federal Clean Water Act;

(D) Surface and subsurface structures;

(E) Utility line locations and type;

(F) Location of existing or planned navigation lanes, channel markers or buoys;

(G) Current and ongoing point and nonpoint wastewater or stormwater discharges to the site and vicinity; and

(H) Other pertinent information determined necessary by the department.

(v) Area and volume dimensions, if known, or estimates of the site;

(vi)The site boundary defined by the individual contaminants exceeding the applicable sediment quality standards of WAC 173-204-320 through 173-204-340 at the point where the concentration of the contaminant would meet:

(A) The applicable sediment quality standards of WAC 173-204-320 through 173-204-340; and

(B) The applicable minimum cleanup level of WAC 173-204-520; and

(C) Recommended site-specific sediment cleanup standards of WAC 173-204-570.

(c) Project administration. Project administration, coordination and communication. This section of the cleanup study plan should provide information on the project coordinatorÁs proposed coordination methods for task management, quality control, and communications with and between local, state and federal agencies, contractors, subcontractors, and laboratories.

(d) Site investigation. This section of the cleanup study plan shall describe the field investigation, sampling and analysis, and other site physical information collection activities that will take place during the study. The rationale and objectives for each activity shall be identified.

(i) Surface water and sediments. Investigations of surface water hydrodynamics and sediment transport mechanisms to characterize significant hydrologic features such as: Site surface water drainage patterns, quantities and flow rates, areas of sediment erosion and deposition including estimates of sedimentation rates, and actual or potential contaminant migration routes to and from the site and within the site. Sufficient surface water and sediment sampling shall be performed to adequately characterize the areal and vertical distribution and concentrations of contaminants. Recontamination potential of sediments which are likely to influence the type and rate of contaminant migration, or are likely to affect the ability to implement alternative cleanup actions shall be characterized;

(ii) Geology and ground water system characteristics. Investigations of site geology and hydrogeology to adequately characterize the physical properties and distribution of sediment types, and the characteristics of ground water flow rate, ground water gradient, ground water discharge areas, and ground water quality data which may affect site cleanup alternatives evaluations;

(iii) Climate. Information regarding local and regional climatological characteristics which are likely to affect surface water hydrodynamics, ground water flow characteristics, and migration of sediment contaminants such as: Seasonal patterns of rainfall; the magnitude and frequency of significant storm events; prevailing wind direction and velocity;

(iv) Chemical contamination of surface water, sediment and fish and shellfish tissue. Sufficient surface water, sediment and fish and shellfish sampling and analyses shall be conducted to adequately characterize the area and vertical distribution and quantity of chemical contamination. Additionally, fish and/or shellfish tissue sampling and analyses shall be conducted to adequately complete risk assessments for chemical contaminant threats to human health and to characterize the site on the basis of human health threat.

(v) Biological effects from site sediments. Acute and chronic sediment toxicity testing using the confirmatory sediment biological tests identified in WAC 173-204-310 and the biological effects criteria stipulated in WAC 173-204-320(3) and 173-204-520(3), as appropriate, may be performed to confirm the results of chemical tests and to evaluate the interactive effects of multiple chemical contaminants at the site.

(vi) Characterization of sediments for potential removal. At a minimum, sediments that may be proposed for potential removal shall be chemically evaluated as follows:

(A) Areas that could be dredged as part of a cleanup action may be sampled using composited samples over depth at individual stations to characterize the chemical contamination; and

(B) The potential for sediment chemical contaminant mobility and loss in sediments proposed for removal shall be evaluated using elutriate, column leaching and column settling tests or other appropriate tests approved by the department.

(vii) Characterization of sediment fate and transport and natural recovery processes. Site physical, chemical and biological effects shall be evaluated to adequately characterize key factors responsible for the addition to or loss from chemical contaminant levels in site sediments. At a minimum, site sampling and testing shall include:

(A) Surface water current measurements at the water surface and sediment surface;

(B) Identification of surface sediment deposition and resuspension rates using Lead 210 dating and site sediment traps; and

(C) Other tests as determined by the department.

(viii) Land use. Information shall be collected to characterize human populations exposed or potentially exposed to sediment contaminants released from the site and present and proposed uses and zoning for shoreline areas contiguous with the site; and

(ix) Natural resources and ecology. Information shall be collected to determine the impact or potential impact of sediment contaminants from the site on natural resources and ecology of the area such as: Sensitive environment, local and regional habitat, plant and animal species, and other environmental receptors.

(e) Sediment contaminant sources. Sufficient information should be collected on all sources of contamination to site sediments to allow a determination of what source control activities must be performed to ensure the long-term success of site cleanup actions. A description of the location, quantity, areal and vertical extent, concentration and sources of active and inactive waste disposal and other sediment contaminant discharge sources which affect or potentially affect the site must be included. Where determined relevant by the department, the following information shall be obtained by the department from the responsible discharger:

(i) The physical and chemical characteristics, and the biological effects of site sediment contaminant sources;

(ii) The status of source control actions for permitted and unpermitted site sediment contaminant sources; and

(iii) A recommended compliance time frame for known permitted and unpermitted site sediment contaminant sources which affect or potentially affect implementation of the timing and scope of the site cleanup action alternatives.

(f) Data management and analysis. This section of the cleanup study shall describe how environmental and other data collected during the field investigation will be managed and analyzed.

(g) Human health risk assessment. This section of the cleanup study shall describe the techniques that will be used to perform human health risk assessments using data collected during the hazard assessment and during the field investigation. The current and potential threats to human health that may be posed by sediment site contamination shall be evaluated using a risk assessment procedure approved by the department. The human health risk assessment should include:

(i) Discussion of the relevance of available data to human exposure including a discussion of any confirmational fish/shellfish tissue data or bioaccumulation test results collected in conformance with WAC 173-204-310;

(ii) Documentation on the proposed use of site-specific exposure parameters established in conformance with WAC 173-204-520(4) ; and

(iii) Recommendations and rationale for site-specific cleanup standards for human health protection (WAC 173-204-570).

(h) Applicable state and federal laws and development of cleanup standards. This section of the cleanup study must present the methods and sources of information that will be used to identify applicable state and federal laws and criteria and the methods that will be used to develop proposed cleanup standards. For purposes of this chapter, the term ‰applicable state and federal lawsÂ includes legally applicable requirements and relevant and appropriate requirements.

(i) Cleanup action alternatives. The cleanup study plan shall present the methods and sources of information that will be used to develop and evaluate the cleanup action alternatives for the site. A preliminary list of technologies to be considered in developing cleanup action alternatives must be presented, and the method that will be used to screen the technologies and combine them into cleanup action alternatives must be described. The cleanup study plan shall also describe the criteria that will be used to screen the technologies and combine them into cleanup action alternatives.

(j) The cleanup study plan shall describe the methods to used to comply with the State Environmental Policy Act.

(7) The cleanup study plan shall address proposed sampling and recordkeeping activities to meet the standards of WAC 173-204-600, Sampling and testing plan standards, and WAC 173-204-610, Records management, and the standards of this section.

(8) The cleanup study plan shall address proposed activities to meet the requirements of the Occupational Safety and Health Act of 1970 (29 U.S.C. Sec. 651 et seq.) and the Washington Industrial Safety and Health Act (chapter 49.17 RCW), and regulations promulgated under those acts. These requirements are subject to enforcement by the designated federal and state agencies. Actions taken by the department under this chapter do not constitute an exercise of statutory authority within the meaning of section (4)(b)(1) of the Occupational Safety and Health Act.

(9) In cases where the person(s) responsible for clean up is not able to secure access to sample sediments on lands subject to a cleanup study plan approved by the department, the department may facilitate negotiations or other proceedings to secure access to the lands. Requests for department facilitation of land access for sampling shall be submitted to the department in writing by the person(s) responsible for
the cleanup action study plan.

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November 8, 2000

VIA MESSENGER

John H. Robertus
Executive Officer
California Regional Water Quality Control Board
San Diego Region
9771 Clairemont Mesa Blvd., Suite A
San Diego, CA 92124-1324

Re: Campbell Industries' Comments on the AET Process for Developing Bay-Bottom Sediment Cleanup Standards (RWQCB Resolutions Nos. 2000-122 and 2000-123)

Dear Mr. Robertus:

Campbell Industries (Campbell) appreciates the additional time granted by the Regional Water Quality Control Board (RWQCB) to provide comments in support of the scientific integrity of the Apparent Effects Threshold (AET) approach to develop sediment cleanup standards. The issue is particularly important to Campbell, as the AET approach was applied at the Campbell site to develop those site-specific sediment cleanup standards adopted in Cleanup and Abatement Order (CAO) No. 95-21.

A. Introduction

The Campbell shipyard sediment standards were developed jointly by Campbell and the RWQCB staff at considerable expense (over $2 million) during the course of approximately seven years. The remediation of the soils and sediments are planned to coincide with the demolition and redevelopment of the site. Campbell ceased all operations at the shipyard on September 30, 1999 and entered into an agreement with the Port on November 16, 1999 to prepare the site for hotel redevelopment. RWQCB issued a Notice of Violation on August 24, 2000 based on the grounds that the remediation had not been completed by June 1, 2000. Campbell is working jointly with the Port to provide a revised schedule for completion. To date, the site has been demolished and extensively assessed and re-assessed. Over the last year, more than 10,000 additional regional soil and sediment data points have been obtained and analyzed. Campbell is in a position to proceed with remediation once revised soil and sediment work plans are approved and the Army Corps of Engineers issues an appropriate dredging permit, which has been pending for over one year.

03-0041.03

These comments supplement the preliminary October 19 comments submitted by Campbell following developments at the October 11 Board hearing concerning the AET process for bay-bottom sediments. Although the October 11 agenda indicated discussions would pertain to other shipyards, much of the discussion apparently centered on the Campbell site and its AET cleanup levels. Campbell was surprised by these reports. In response to these developments, Campbell promptly requested that the original October 19 deadline for public input be extended through November 8 so that Campbell could obtain the hearing transcript and understand the basis for the Board's concerns.

B. The AET Process is Scientifically Sound and Increasingly Accepted Across the Country

The attached comments from sediment quality experts, Lucinda Jacobs, Ph.D., of Exponent and John Herzog, Ph.D., of Hart Crowser, discuss the scientific integrity of the AET process at the Campbell site and the increasing acceptance of the AET approach across the country. Both experts have extensive sediment remediation and AET experience in the State of Washington, which has led the nation on this issue. Dr. Jacobs was involved in the development of the AET standards at the Campbell site in the early 1990s. Dr. Herzog also brings considerable Puget Sound expertise to the Campbell project and is working on behalf of Campbell with the RWQCB staff to develop an updated sediment work plan.

The practical considerations in favor of maintaining the AET approach at the former Campbell shipyard have been outlined in our October 19 preliminary submittal. These considerations include (i) the enormous investment of time and resources in developing the AET standards for the Campbell site, (ii) the legacy of substantial third party and municipal discharges into the shipyard leasehold since the early part of this century, and (iii) the adverse impacts to the future ballpark redevelopment.

Even assuming "background" could be defined in a Bay that has received well over a century's worth of industrial, military, and municipal deposits, a "background" program is fundamentally flawed because it is not rooted in toxicology and science. It is rooted in the notion that all "human impact" must be reversed, once argued by environmentalists in the aftermath of pervasive agricultural use of DDT from the 1940s through 1972 to control insects and the usage of lead additives in fuels through 1970s and 1980s. Although DDT and lead now exist at detectable ambient "background" levels throughout California and the world as a result of past usage, it is not subject to serious dispute that levels exist at which neither substance presents a material threat to human health or the environment. In recognition of this fact, even most environmentalists now recognize that all past industrial releases cannot feasibly be reversed to pre-industrial era "background." Simply put, the AET process focuses more on toxicity than removing every molecule from San Diego Bay.

C. The AET Opponents Erroneously Assert That the "Law" Requires Sediments to be Dredged to "Background" Sediment Conditions

Of particular concern, the Environmental Health Coalition (EHC), Bay Keeper and the San Diego Audubon Society (collectively, the "AET opponents") erroneously state that the "law requires cleanup" to "background" sediment conditions. No such law exists. Indeed, as Paragraph 33 of the CAO recognizes "[t]here are currently no sediment quality objectives established for use in California." The Porter-Cologne Act regulates discharges to water. It does not regulate sediment quality or sediment conditions reflective of over 100 years of accumulated regional discharges to San Diego Bay. Only the State of Washington has adopted numerical sediment quality standards, and these standards are based upon AET principles.

State Water Resources Control Board (State Board) Resolution 92-49 was cited repeatedly by the AET opponents during the October 11 hearing in an effort to shoehorn established water quality policies into a new sediment quality program. Properly read, Regulation 92-49 is a compilation of various water quality "policies" and "procedures." Indeed, no court has applied Resolution 92-49 to impose new sediment quality standards. Nor has the State Board ever interpreted Resolution 92-49 to require any sediment-dredging project attain sediment background conditions. Campbell is not aware of a single dredging project in California where any Regional Board has purported to apply Resolution 92-49 as legal authority to require dredging to "sedimentary background" levels.

Although Resolution 92-49 was in existence for three years before the Board adopted the Campbell CAO 95-21, the State never attempted to invoke it in connection with Campbell's sediment cleanup levels. The Campbell CAO and AET standards are legally based on the site's 1985 NPDES permit and Section 13304 of the Porter-Cologne Act relating to discharges to water of certain shipyard repair byproducts.

Unfortunately, much confusion has been created by the AET opponents in loosely equating impacts to the regional benthic community arising from shipyard sediment quality and ambient ocean "water quality." Sediment quality and water quality are not equivalent. Impacted sediments may or may not affect water quality depending upon, for example, the extent of contact with the water column or isolation of the sediments by physical barriers (such as further sediment deposits, a site cap, or a bulkhead for impacted downtown San Diego soils).

EHC has overreached before on the issue of San Diego Bay sediments, seeking in 1991 to apply the federal and state anti-degradation policies for water quality to prohibit all treated or untreated construction dewatering, cleanup dewatering and permanent dewatering discharges to San Diego Bay. See *In the Matter of the Petition of Environmental Health Coalition*, SWRCB Order WQ 91-10; 1991 WL 214438 (Sept. 26, 1991), a copy of which is attached as Exhibit 3. In response to growing evidence of high levels of groundwater pollution in downtown San Diego, this Board adopted in 1991 effluent limits in the General NPDES Permit for San Diego Bay that required treatment of all dewatering activities so that discharges would be cleaner than the receiving Bay waters. EHC appealed.

The State Board rejected EHC's position to stop all discharges to the Bay, concluding that it "would be tantamount to prohibition of all ground water cleanup activity and new construction in downtown San Diego." Of note, in attempting to forbid dewatering discharges altogether to the Bay, EHC proposed biological testing of sediments "as a reliable indicator of possible adverse impacts to aquatic life." Not only does EHC now depart from its earlier 1991 support of biological testing of sediments, which Campbell has already undertaken, it fails to consider the practical consequences of its "sediment background" proposal, such as re-suspension of contaminants, upland disposal of sediments, cost ineffectiveness, a century of accumulated impacts, and stalled downtown redevelopment.[1]

In 1992, the very year Resolution 92-49 was adopted by the State Board, EHC challenged another sediment remediation project in San Diego Bay. Specifically, it opposed the RWQCB's upward adjustment of the site-specific sediment cleanup level for copper at Paco Terminals in National City, which level was raised from 1000 to 4000 mg/kg. See *In the Matter of the Petition of Environmental Health Coalition and Eugene J. Sprofera*, SWRCB Order No. WQ 92-09; 1992 WL 297157 (Sept. 17, 1992), a copy of which is attached as Exhibit 4. Paco Terminals stored and loaded copper ore in National City in the late 1970s. The "background" sediment copper concentration in San Diego Bay at the time was apparently 110 mg/kg.

In 1992, the Paco Terminals site-specific cleanup level for copper was modified by this Board from nine times "background" for copper (1000 mg/kg) to 36 times "background" (4000 mg/kg). The copper level outlined in the CAO was adjusted upward by this Board based on the submittal of additional sediment data that showed 4000 mg/kg of copper in the sediment would maintain copper concentrations in the water column at less than 5 μg/l (6-month median). The Board concluded 5 μg/l of copper in water would sufficiently protect beneficial uses in San Diego Bay.

Upon review, the State Board stated that it could not conclude that the available data established with sufficient accuracy that the 4000 mg/kg sediment standard would maintain water concentrations at Paco Terminals below the numerical water quality objective for copper of 2.9 μg/l (1-hour average), as outlined in the 1974 "Enclosed Bays and Estuaries Plan." The State

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1 It is noteworthy that the AET opponents stated at the October 11 hearing that they are willing to accept re-suspension of contaminants into the San Diego Bay water column and shallow sediments through extensive dredging. The National Academy of Sciences, however, is expected to issue a seminal report on dredging this fall. This report is expected to evaluate the effectiveness of extensive dredging. In August 2000, General Electric completed an evaluation of 26 dredging projects, which concluded that dredging may actually re-suspend significant contamination and leave behind even higher concentrations of contaminants in surface sediments. A copy of this evaluation report is attached as Exhibit 5. The dredging report further demonstrates that sediment cleanups across the country are based upon mainly principles of toxicology and not default "background" conditions. The Board should await and consider the forthcoming National Academy of Sciences report on dredging projects.

Board elected to reinstate the 1000 mg/kg cleanup level at Paco Terminals (9 times background) unless and until more site-specific testing on copper was conducted at 36 times background that showed concentrations in the water column remained below 2.9 μg/l, the 1-hour standard for copper outlined in the Enclosed Bays and Estuaries Plan.

In challenging the adjustment to the Paco Terminal sediment cleanup level, EHC stated, as here, that the 4000 mg/kg sediment cleanup level would violate the Porter-Cologne Act Section 13304 (discharges to water) and all related state water policies. Of note, EHC argued in favor of the initial 1000 mg/kg sediment standard for copper (or nine times "background"). At Paco Terminals, EHC apparently never took the position that the 110 mg/kg "background" Bay concentration for copper should be the cleanup level or was "required by law."

The State Board also never suggested that Resolution 92-49 governs Paco Terminals sediment quality or mandates "background" sediment conditions in San Diego Bay. The State Board in fact acknowledged, as does Paragraph 33 of CAO 95-21, that numerical sediment quality standards do not exist in California. At the Paco Terminals site, the focus of the State Board was to determine whether available site-specific testing of sediments would effectively confirm that dissolved copper concentrations in the water column would be maintained within the 1-hour numerical water standards outlined in the State's Enclosed Bays and Estuaries Plan.

The AET approach at Campbell is even more protective than the approach at Paco Terminals. Whereas, in 1992 the standard for copper cleanup at Paco Terminals was 1000 mg/kg, it is 810 mg/kg at Campbell. However, EHC contradicts its prior position before this Board, arguing at this juncture in favor of "sediment background" or a "no human contact" standard instead of focusing more appropriately on water quality or biological data. This is the functional equivalent of seeking to reverse all background concentrations of DDT or lead in California relating to past agricultural and industrial practices. Unlike today, EHC never took the position at Paco Terminals that Resolution 92-49 required the attainment of background conditions for copper. Rather, EHC argued in favor of a standard well above background, citing the same authority it purports nine years later requires cleanup to standards that existed "before human contact."

The AET opponents also ignore the accumulated impacts to sediments from decades of storm water discharges from the adjoining Switzer Creek and municipal discharges from the City incinerator and Eighth Avenue storm drain, both of which impact the Campbell site directly. It is not subject to serious dispute that these non-shipyard sources have degraded water quality generally around the shipyard which, in turn, have led to deposits and impacts to regional sediments. To be clear, despite the AET opponents' aggressive misinterpretations of water quality law, Resolution 92-49 is not a sediment quality statute. Nor does this Resolution purport to apply to discharges to the Bay unrelated to Campbell.

Nevertheless, at the October 11 hearing, the AET opponents repeatedly maligned the Campbell standards as "improper" and "bad precedent," never once addressing the increasing scientific acceptance of the AET process across the country and the years of successful AET application in Puget Sound and elsewhere. The process is highly deliberative, in Campbell's case taking over seven years and approximately $2 million in studies and assessment to develop appropriate standards in conjunction with the staff. Ignoring the weight of scientific and empirical evidence, the AET opponents demand that this Board -- irrespective of cost consequences and decades of municipal discharges -- compel certain Port tenants to restore San Diego Bay to those conditions that existed "before any human impact." This position resembles EHC's 1991 proposal to prohibit further development in downtown San Diego. Given the extensive use of the Bay by the City, military and various utilities for disposal purposes in the 1800s and 1900s, one would have reach back well over 120 years across the entire Bay even to meet EHC's "no human impact" standard.

Campbell understands that various comments were also made at the last hearing regarding the availability of insurance. Campbell's insurance carriers have thus far denied all claims made by the former shipbuilder under its policies in connection with CAO 95-21. While Campbell disputes the basis for the carriers' denial, it would be erroneous to conclude that Campbell can rely upon insurance.

D. Conclusion

In summary, the AET opponents attempt to shoehorn water quality policies that do not even purport to regulate sediment quality into a draconian sediment program. In so doing, EHC completely contradicts its prior representations to this Board. The long-term impacts of such a non-AET program on the Port, terminal operations and small boatyards have never been addressed. The AET opponents overlook decades of military, industrial and municipal practices that have led to accumulated deposits in Bay sediments, assuming incorrectly that Campbell or other individual Port tenants are solely responsible. As discussed in our October 19 comments, the third party impacts are significant and cannot be overlooked.

The weight of science flatly contradicts the position of the AET opponents. The law also fails to support their position. In short, the AET process works well at the Campbell site, and there is no reason to believe that this scientific approach would not work well at other sites. Thank you for your courtesy and consideration of this important matter.

Sincerely,

H. Allen Fernstrom

ATTACHMENTS

cc: Vicente R. Rodriguez (RWQCB) (20 copies)
Tom Alo (RWQCB)
John Richards, Esq. (SWRCB)

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INDEX OF EXHIBITS IN SUPPORT OF CAMPBELL INDUSTRIES NOVEMBER 8, 2000 COMMENTS ON THE AET PROCESS

EXHIBIT	DESCRIPTION
1	Comments of Lucinda Jacobs, Ph.D. of Exponent, dated November 7, 2000
2	Comments of John Herzog, Ph.D. of Hart Crowser, dated November 7, 2000
3	*In the Matter of the Petition of Environmental Health Coalition*, SWRCB Order WQ 91-10; 1991 WL 214438 (Sept. 26, 1991) [Dewatering Matter]
4	*In the Matter of the Petition of Environmental Health Coalition and Eugene J. Sprofera* SWRCB Order No. WQ 92-09, 1992 WL 297157 (Sept. 17, 1992) [Paco Terminals Matter]
5	"Environmental Dredging: An Evaluation of its Effectiveness in Controlling Risks," General Electric Company Corporate Environmental Programs, Albany New York (Aug. 2000)
6	August Felando, "The Last Boat from Tunaville: A History of San Diego's Tuna Industry," *San Diego Lawyer*, p. 32 (Nov./Dec. 2000)

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Apparent Effects Threshold—Background and Rationale for Use in San Diego Bay

Lucinda Jacobs, Ph.D.

The Apparent Effects Threshold (AET) approach is a proven, technically sound method that has been used to develop site-specific sediment quality values for the Campbell Shipyard site. I participated directly in the development of the sediment cleanup levels for Campbell Shipyard from 1990 to 1995.

The primary impetus for this technical memorandum is the recent attacks on the AET approach by individuals who are not fully informed of the technical basis of the AET approach or its developmental background. Cleanup to AET has been described as cleanup to the "edge of destruction," which is inflammatory rhetoric with no basis in fact. Cleanup to background levels, which has been advanced by some as the only protective cleanup alternative, would in fact be cleanup to arbitrarily defined numerical values with no relationship to potential adverse effects. The fact that cleanup to background would be the most costly alternative in no way makes it better or technically defensible.

Cleanup to background is not science-based. **All** of the various methods that have been used to develop sediment quality values (e.g., AET values, equilibrium partitioning values, the National Oceanic and Atmospheric Administration's ER-L and ER-M, U.S. Fish and Wildlife's NEC values) have demonstrated that adverse effects occur well above background levels. The whole purpose of developing effects-based cleanup levels is to optimize the effectiveness of the cleanup. As cleanup levels approach background, the potential for "false positives" increases. Time and resources are spent to clean up sediments that do not warrant cleanup. Furthermore, cleanup results in short-term injury to the benthic infauna that inhabit the sediment.

This technical memorandum provides background on the development of the AET approach, its validation by technical peer review and regulatory agencies, and its application in San Diego Bay.

Background

The AET approach is a method used to identify chemical concentrations in sediments above which statistically significant biological effects are expected to occur. The method was first developed in the mid-1980s for use at the Commencement Bay Superfund site, a heavily industrialized harbor in Tacoma, Washington. The method was subsequently reviewed by a U.S. Environmental Protection Agency (EPA) science advisory board (U.S. EPA 1989), which determined that:

> The method has major strengths in its ability to determine biological effects and assess interactive chemical effects. The method is considered by the subcommittee to contain sufficient scientific merit that, with appropriate validation, it could be used to estimate sediment quality at specific sites.

They stated further:

> The Subcommittee recognizes the Apparent Effects Threshold Approach is a credible step toward development of a technically defensible tool for managing contaminated sediments. The approach provides a constructive beginning towards assessing the impact of mixtures of chemicals as they occur in actual situations. Such innovative empirical approaches that assess actual contamination and concomitant effects are encouraged and applauded by the Subcommittee.

In the time since its initial application in Commencement Bay, the AET approach has been used by other regulatory programs in the development of guidelines for the protection of aquatic life. The Urban Bay Toxics Action Program, initiated in 1984 in the

State of Washington, was a multiphase program to control pollution of urban bays in Puget Sound, and was a major component of the Puget Sound Estuary Program (PSEP). Major funding and overall guidance for the program was provided by the EPA Office of Wetlands, Oceans, and Watersheds. In the PSEP, AET values were used in conjunction with site-specific biological tests in the assessment of sediment contamination to define and rank problem areas.

In 1985, the Puget Sound Dredged Disposal Analysis (PSDDA) program was initiated to develop environmentally safe and publicly acceptable options for unconfined, open-water disposal of dredged material that was being removed for navigational purposes. PSDDA is a cooperative program conducted under the direction of the U.S. Army Corps of Engineers. AET values were used to develop chemical-specific guidelines to determine whether biological testing on contaminated dredged material was needed prior to dredging and disposal.

Washington State adopted sediment management regulations, referred to as Sediment Management Standards, in April 1991. These standards address both sediment source control and sediment cleanup activities. The regulations include standards for a large number of chemicals that commonly occur in sediments. These numerical values were developed using the AET approach.

Chris Ingersoll of the U.S. Fish and Wildlife Service used an approach similar to the AET approach to develop sediment quality values for the Great Lakes (Ingersoll et al. 1996). He called these freshwater sediment quality values No Effects Concentrations (NECs). The primary differences between NEC values and AETs are that NECs were also calculated for pore water concentrations (AETs have only been developed for whole sediment samples) and comparisons were made to a laboratory control rather than a field reference sample.

Since their development, the AET approach and the closely related NEC approach have been used throughout the United States to develop sediment quality values, cleanup levels, and decision criteria.

Overview of Technical Approach

The AET approach is included in EPA's *Sediment Classification Methods Compendium* (U.S. EPA 1992). As discussed in that document, the AET approach can be used to:

- Determine the spatial extent and relative priority of areas of contaminated sediment
- Identify potential problem chemicals in impacted sediments and focus cleanup on potential sources
- Define and prioritize laboratory studies for determining cause–effect relationships
- With appropriate safety factors, screen sediments in regulatory programs that involve extensive biological testing.

For remedial action programs, the AET approach can be used to address the following specific regulatory needs (U.S. EPA 1992):

- Provide a preponderance of evidence for narrowing a list of problem chemicals measured at a site
- Provide a predictive tool for cases in which site-specific biological testing results are not available
- Enable designation of problem areas within a site

- Provide a consistent basis on which to evaluate sediment contamination and to separate acceptable from unacceptable conditions

- Provide an environmental basis for triggering sediment remedial action

- Provide a reference point for a cleanup goal.

AET values are derived using a straightforward mathematical formula that relates biological and chemical data from field collected samples. For a given data set, the AET for a particular chemical is the highest "no-effects" sediment concentration, above which a particular biological effect (e.g., reduced growth of a particular test species) is always observed. The biological response at the location with the next highest chemical concentration (i.e., the station or stations above the AET) often reflects fairly mild or limited biological responses. For example, at Campbell Shipyard, a statistically significant adverse response was detected at only 4 of the 14 test stations for the amphipod test,[1] and ranged from 26 to 36 percent mortality. Although these stations were defined as impacted and used to develop cleanup levels for Campbell Shipyard, it is not unusual to see this level of response in clean reference areas simply due to physical conditions (e.g., sediment grain size) or variations in organism sensitivity. AETs are not just derived from lethal (i.e., mortality) endpoints. For example, at Campbell Shipyard, the growth of *Neanthes*, a polychaete worm, was evaluated.

When multiple biological tests are conducted, a corresponding number of AETs are generated for each chemical of interest. The lowest of these values is commonly referred to as the LAET, and represents the most protective sediment quality value for a particular

[1] The amphipod test used at the Campbell Shipyard site used the organism *Rhepoxinius abronius*. This test method has been developed and refined by researchers throughout the country. The method is formalized in protocols of EPA and the American Society for Testing and Materials. This organism was originally selected as a test organism because it lives in the sediments and is considered sensitive to toxic chemicals.

chemical. The environmentally protective LAET was used as the cleanup level at the Campbell Shipyard site.

The occurrence of biologically impacted stations below the AET of a single chemical does not imply that AET values in general are not protective against biological effects, only that a single chemical may not account for all stations with biological effects.

Use of the AET Approach in San Diego Bay

The AET approach was used at the Campbell Shipyard site because it is a sound scientific method that uses a preponderance of evidence to develop site-specific sediment quality values. It is a widely accepted approach that has been approved for use by EPA (U.S. EPA 1989, 1992) and has been incorporated into a number of regulatory programs. The work done at Campbell Shipyard is some of the earliest work done on marine sediments using integrated biological and chemical testing. Staff members of the San Diego Regional Water Quality Control Board (RWQCB) were closely involved with the design and implementation of the sediment investigation. Port staff were also kept apprised of the process throughout the investigation and remedy development.

The use of the AET approach at the Campbell Shipyard site was first proposed in the study proposal, which was submitted to RWQCB staff in 1990 (PTI 1990). This work culminated in the *Remedial Action Alternatives Analysis Report* (PTI 1993). The cleanup levels for the Campbell Shipyard site, which are based on AET values, were approved and incorporated into the Cleanup and Abatement order, which was finalized in 1995. The Campbell Shipyard investigation is still one of the most thorough and rigorous environmental investigations conducted in San Diego Bay. Chemical analyses, sediment toxicity testing, benthic infauna enumeration, and bioaccumulation analyses (i.e., analysis of fish and shellfish) were conducted at the site to assess potential hazards not only to aquatic organisms that live on the site, but to humans and wildlife that could consume fish and shellfish from the site. Both the tests and test interpretation methods used at the

Campbell Shipyard site have withstood the test of time, and are still being used throughout the country. There is no technically defensible reason to revisit the cleanup levels developed for Campbell Shipyard or to reject their use at this site.

References

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November 7, 2000

John H. Robertus
Executive Officer
California Regional Water Quality Control Board
San Diego Region
9771 Clairemont Mesa Blvd., Suite A
San Diego, California 92124-1324

Re: Apparent Effects Threshold (AET) Methodology as Applied to Determining Sediment Cleanup Criteria at the Campbell Shipyard Site
J-6897-01

Dear Mr. Robertus:

On behalf of Campbell Industries, Hart Crowser is submitting this letter describing the use of Apparent Effects Threshold (AET) methods for development of sediment cleanup criteria at the Campbell Shipyard in San Diego, California. Presently, Hart Crowser is the primary technical contractor to Campbell Industries for remediation of the Campbell Shipyard site in San Diego, California.

This letter was prepared in response to recent criticism on the effectiveness of the AET approach voiced at meetings of the San Diego Regional Water Quality Control Board. Recently, cleanup to the AET has been misleadingly described as cleanup to the "edge of destruction." Alternatively, cleanup to background levels has been misleadingly proposed by AET opposition groups as being the only environmentally protective solution to sediment contamination in San Diego Bay. We believe that these claims have no sound basis based on the following:

- Utilization of AET methodology for developing sediment quality criteria is protective of marine organisms residing in soft bottom sediments;
- Remediation strategies utilizing the AET approach will result in cleanup of contaminated sediments posing an ecological risk at the Campbell Shipyard site; and
- Cleanup to background is not science-based or cost-effective since remediation would be performed to arbitrarily defined levels which have no relationship to the potential adverse effects of contamination.

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The primary purpose of utilizing effects-based cleanup levels (such as AET) is to optimize the environmental protectiveness and cost-effectiveness of sediment cleanup.

Apparent Effects Thresholds

The AET approach is a scientifically proven approach for developing site-specific sediment cleanup criteria for the protection of the benthic community in bays and estuaries. The AET approach integrates bulk sediment chemistry, sediment bioassay data, and biological effects data to determine sediment chemical concentrations above which adverse environmental effects to the benthic community are predicted to always occur. Bioassay tests (where organisms are exposed to site sediment) are performed to measure acute toxic effects using different species. Acute tests measure percent survival, and chronic tests measure growth suppression of organisms exposed to test sediments. Typically, both acute and chronic tests are performed when determining site-specific cleanup criteria. Results from the test sediment bioassays are compared to results of similar tests performed on reference sediment. The reference sediment (i.e., background sediment) is substantially free of contaminants and has similar physical properties (i.e., grain size) as the test sediment. Statistical comparisons of the site sediment bioassay results to reference bioassay results are performed to determine the effect of contaminants on the test species. Biological effects testing, which entails examination of site-specific samples, include the identification and counting of benthic species present in the site and reference sediments. Here as in the case of bioassay testing, statistical comparisons are made between the test sediments and the reference sediments to determine the effect of sediment contaminants on the test species.

In addition to biological analysis, sediment chemistry is determined for each sample. These chemical data are synthesized with the biological testing data to determine the "effects" and "no-effects" distributions for each test sample. The AET is the chemical concentration above which an adverse effect in a specific biological test always occurs. Thus, AETs are specific to individual chemicals and biological tests. For example, each biological test will have its own unique AET for a particular chemical concentration where adverse effects are always observed. For the Campbell Shipyard project, the site-specific AET value for each chemical was selected as the lowest observed effects concentration (LAET) from the three biological tests performed on a given sample. Use of the LAET is considered conservative since it is derived from the lowest observed effects concentration from a suite of tests which consider multiple endpoints (i.e., benthic abundance and acute or chronic effects on marine organisms). The conservative nature of this approach achieves the San Diego Regional Water Quality Control Board's beneficial use goal—protection of marine organisms at the Campbell Shipyard site. Therefore, the use of AET as sediment remediation criteria enables this approach achieves the San Diego Regional Water Quality Control Board's beneficial use goal—protection of marine organisms at the Campbell Shipyard site. Therefore, the use of AET as sediment remediation criteria enables properties with contaminated sediments to be remediated and achieves the beneficial use goal.

The major advantages of the AET approach are that combined chemical effects can be considered and there is no constraint on the type of chemical contaminant or observed biological effect. Additionally, because observed biological effects always occur above the AET, the approach provides sediment cleanup criteria values based on clear evidence of biological impact to the benthic community based on the sediment chemistry. Thus, the site-specific AET values can be used to predict whether biological effects to the benthic community could be expected based on the sediment chemistry.

Regulatory Acceptance of AET Methodology to Determine Sediment Cleanup Criteria

The State of Washington and the U.S. Environmental Protection Agency (EPA) Region 10 have adopted the use of AET for identifying and prioritizing sediment cleanup sites and for determining the site-specific sediment cleanup standards at multiple sites in Washington including the Commencement Bay Superfund site, Harbor Island Superfund site, Whatcom Waterway, and Eagle Harbor Superfund site. The AET approach was also adopted by state and federal resource agencies, including the Army Corps of Engineers, for use in dredged material management programs in Washington and Oregon. Additionally, AETs are currently being utilized or considered for determining sediment cleanup criteria in areas of California, Oregon, Hawaii, the northeast United States, and in Canada.

Conclusions

The AET approach is scientifically proven and accepted by other resource agencies. This methodology is designed to be protective of the marine organisms by consideration of contaminant effects. The application of this method at the Campbell Shipyard site by the San Diego Regional Water Quality Control Board is a completely valid approach for establishing environmentally protective and cost-effective sediment cleanup standards.

We appreciate this opportunity to submit these comments on behalf of Campbell Industries.

Sincerely,

HART CROWSER, INC.

JOHN M. HERZOG PH.D.
Sediment Quality Specialist

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Citation | Found Document | Rank(R) 1 of 1 | Database CAENV-ADMIN
1991 WL 214438
(Cite as: 1991 WL 214438 (Cal.St.Wat.Res.Bd.))

State Water Resources Control Board
State of California

*1 IN THE MATTER OF THE PETITION OF
ENVIRONMENTAL HEALTH COALITION
ORDER NO. WQ 91-10
September 26, 1991

For Review of Waste Discharge Requirements Order No. 90-31 for Ground Water Dewatering Waste Discharges to San Diego Bay or Tributaries Thereto Issued by the California Regional Water Quality Control Board, San Diego Region. NPDES Permit No. CA0108707. Our File No. A-686

BY THE BOARD:

On May 23, 1990, the State Water Resources Control Board (State Board or Board) received a petition from the Environmental Health Coalition (EHC). The petition sought review of Waste Discharge Requirements Order No. 90-31 (the General Permit) which was issued by the Regional Water Quality Control Board, San Diego Region (Regional Board) on April 23, 1990.

The time limit for reviewing this petition expired on August 4, 1991 (23 C.C.R., Section 2052). Therefore, the Board is reviewing the contentions raised in the petition on its own motion (Water Code Section 13320).

I. BACKGROUND

Order No. 90-31 is a General NPDES Permit [FN1] which regulates ground water dewatering discharges to San Diego Bay and its tributaries. [FN2] There are three types of dewatering operations covered by the permit. The first, cleanup dewatering, is done to treat polluted ground water. The second, construction dewatering, is done during construction in order to keep the construction site dry. The third, permanent dewatering, is done to prevent ground water intrusion into the portions of a building which are located below the water table.

At the time the General Permit was adopted, it was expected that most of the permitted discharges would be approximately 10,000 to 15,000 gallons per day, and that some of the discharges would be up to 500,000 gallons per day.

In recent years, numerous areas of ground water pollution in San Diego have been discovered, particularly in the downtown area which neighbors San Diego Bay. Most of this pollution has been caused by petroleum and related compounds discharged from leaky underground tanks. The great scope of the ground water pollution problem has led to increased cleanup dewatering operations, and has increased the likelihood that these pollutants will be intercepted by construction and permanent dewatering operations.

Regional Board staff proposed adoption of a General Permit to cover all dewatering discharges to San Diego Bay and held a workshop in November, 1989 to receive comments and suggestions regarding regulation of such discharges. Then, in April, 1990 the Regional Board adopted Order No. 90-31.

Order No. 90-31 permits construction dewatering, cleanup dewatering, and existing permanent dewatering discharges. It prohibits new permanent dewatering discharges. [FN3]

Due to high levels of four pollutants, copper, mercury, tributyltin (TBT), and polychlorinated biphenyls (PCBs), San Diego Bay is listed in this Board's 1990 Water Quality Assessment (WQA) as having impaired water quality and has been placed on several Clean Water Act-mandated lists of impaired water bodies. These lists are the 131.11 list (segments which may be affected by toxic pollutants); 303(d) list (water quality limited segments where objectives or goals may not be attainable with BAT/BCT); the 304(1) list (the "Long List", narrative or numeric objectives are violated or beneficial uses are impaired); and the 319 list of surface waters with nonpoint source problems. The beneficial uses in San Diego Bay that are considered impaired are ocean commercial and sport fishing, shellfish harvesting, and marine habitat.

***2** The predominant sources of TBT and copper in San Diego Bay are outside the control of the dischargers to be covered under the General Permit. These sources include urban runoff and antifouling paints from marine vessels. A major source of copper pollution comes from copper ore deposits in the vicinity of Paco Terminal. The 1990 WQA states that urban runoff and industrial activities are the sources of PCBs and mercury.

At the time the Regional Board issued the General Permit, the State Board had not yet adopted the California Enclosed Bays and Estuaries Plan (EBE Plan) (adopted April 1991). The Enclosed Bays and Estuaries Policy (EBE Policy), which was adopted in 1974, does not contain any numerical water quality standards. The Regional Board took guidance from the California Ocean Plan (Ocean Plan) (revised September 1988) and the U.S. Environmental Protection Agency's (EPA) 1986 Water Quality Criteria (the Gold Book). Effluent limitations in the General Permit are based on the Ocean Plan or on the Water Quality Control Plan for the San Diego Region (Basin Plan). If ground water is polluted with petroleum related wastes, the General Permit requires treatment based on best available technology economically achievable for removal of contaminants listed in the General Permit. Ground water which complies with effluent limitations without treatment need not be treated.

II. Preliminary Issue

There is an issue which should be addressed before petitioner's contentions are considered. It is a restriction of the area in which discharges are permitted under the General Permit.

The title of the General Permit and numerous provisions of the General Permit indicate that it is regulating discharges to San Diego Bay or "tributaries thereto" (General Permit Sections A.7., A.8., A.9., and B.1.). Major tributaries to San Diego Bay are the Sweetwater and Otay Rivers.

On the other hand, none of the findings in the General Permit deal with water bodies which are tributary to San Diego Bay. For example, there is no finding regarding the beneficial uses of these rivers. The record submitted to the State Board by the Regional Board contains no evidence which pertains to these rivers. The record focuses exclusively on discharges to San Diego Bay. Moreover, the Fact Sheet presented to the Regional Board when the General Permit was adopted indicates that discharges are to be permitted to "San Diego Bay and storm drains or other conveyances tributary to San Diego Bay."

It appears, therefore, that the Regional Board intended to limit discharges under the permit to San Diego Bay and not its tributaries. Even if this was not the Regional Board's intent, there is not an adequate record to support permitting discharges to tributaries to San Diego Bay. The title of the General Permit and pertinent provisions of the General Permit should be amended to confine discharges to San Diego Bay and storm drains or other conveyance systems tributary thereto.

II. CONTENTIONS AND FINDINGS

***3** Contention: Petitioner asserts that additional discharges into San Diego Bay should be prohibited based on the antidegradation policy in 40 C.F.R., Section 131.12. [FN4]

Finding: The relevant portions of 40 C.F.R., Section 131.12 (Antidegradation Policy) state:

"The antidegradation policy and implementation methods shall, at a minimum, be consistent with the following:

"(1) Existing instream water uses and the level of water quality necessary to protect the existing uses shall be maintained and protected.

"(2) Where the quality of the waters exceed levels necessary to support propagation of fish, shellfish, and wildlife and recreation in and on the water, that quality shall be maintained and protected unless the State finds, after full satisfaction of the intergovernmental coordination and public participation provisions of the State's continuing planning process, that allowing lower water quality is necessary to accommodate important economic or social development in the area in which the waters are located. In allowing such degradation or lower water quality, the State shall assure water quality adequate to protect existing uses fully. Further, the State shall assure that there shall be achieved the highest statutory and regulatory requirements for all new and existing point sources and all cost-effective and reasonable best management practices for nonpoint source control." [FN5]

Petitioners allege that because the Bay is water quality impaired, all discharges to the Bay should be prohibited (40 C.F.R., Sections 131.12(a)(1) and 122.4(i)). Petitioners are not correct. Water quality impairment in San Diego Bay is caused by only four waste constituents: copper, mercury, TBT, and PCBs. Discharges of those four pollutants to San Diego Bay should be prohibited only if such discharges contribute to violations of water quality objectives.

Discharges of copper, mercury, TBT, and PCBs will not contribute to violations of water quality objectives if they are discharged at levels which do not exceed those objectives. Effluent meeting water quality objectives can only improve water quality in San Diego Bay where waste levels exceed water quality objectives due to sources other than these discharges. In other words, if these discharges comply with water quality objectives, they will be cleaner than the receiving water. [FN6]

At the time that the Regional Board adopted the General Permit, there were no numerical water quality objectives for mercury, copper, TBT, and PCBs established for enclosed bays. Since that time, the State Board has promulgated, in the EBE Plan, numerical water quality objectives for the protection of aquatic life and human health which apply to San Diego Bay. (Plan pp. 2-7, A1-1). The EBE Plan includes methods for calculating effluent limitations in order to implement the water quality objectives (Plan pp. 11-

12). If the effluent limitations in the General Permit for mercury, copper, TBT, and PCBs are amended to implement these numerical water quality objectives, discharges of those constituents would be permissible. Therefore, this Order amends the effluent limitations in the General Permit for these four constituents.

***4** The EBE Plan provides that when the ambient background concentration of a substance in a receiving water body equals or exceeds the water quality objective, the effluent limitations must be set at the water quality objective (EBE Plan p. 11). [FN7]

The ambient background concentrations in San Diego Bay for mercury, copper, TBT, and PCBs exceed water quality objectives in the Plan (1990 WQA). The effluent limitations in the General Permit for mercury, PCB, and copper should be amended to conform with the water quality objective in the EBE Plan. [FN8] The effluent limitation for mercury should be amended to add a 30-day average of .025 ug/l [FN9] and a 1-hour average of 2.1 ug/l. The effluent limitation for copper should be amended to add a 1-hour average of 2.9 ug/l. The effluent limitation for PCBs should be amended to add a 30-day average of .00007 ug/l.

There is no effluent limitation for TBT included in the General Permit. An effluent limitation for TBT should be added to the General Permit at the level of the water quality objective established by the EBE Plan. The effluent limitation for TBT should be a 30-day average of .005 ug/l.

Other waste constituents covered by the General Permit exist in San Diego Bay at levels which do not violate receiving water objectives. Because the Bay waters are of high quality as to those other waste constituents, discharges containing those constituents should be analyzed pursuant to the second paragraph of the Antidegradation Policy (40 C.F.R., Section 130.12(a)(2)) and State Board Resolution No. 68-16, "Statement of Policy With Respect to Maintaining High Quality of Waters in California" (Resolution No. 68-16).

There is not sufficient evidence in the record to determine whether or not discharge of these waste constituents will degrade the water quality of San Diego Bay if they are discharged at levels provided in the General Permit. Nonetheless, even if degradation will occur, the General Permit contains a finding which concludes that the permit complies with the Antidegradation Policy and Resolution No. 68-16. (General Permit, Finding 20). There is ample evidence in the record to support this finding. [FN10]

As required by the Antidegradation Policy and Resolution No. 68-16, the effluent limitations in the General Permit are sufficiently stringent that discharges will not unreasonably affect present or anticipated beneficial use of the Bay or cause a condition of pollution or nuisance. [FN11]

The express reason for issuing the General Permit was the discovery of high levels of hydrocarbon pollution in the City of San Diego, particularly in the downtown area which neighbors San Diego Bay. The General Permit is intended to facilitate ground water cleanup and to assure that construction dewatering operations do not inadvertently discharge pollutants. Temporary construction dewatering operations cannot be avoided in a high ground water area like San Diego. The need for temporary cleanup dewatering is obvious. Polluted ground water must be pumped in order to treat it and the treated water must be disposed of. The General Permit further limits the impact of ground water dewatering discharges by prohibiting new permanent discharges.

***5** The Regional Board considered all feasible alternatives to discharging to

San Diego Bay. Reuse of ground water was rejected because of its high salt content. Reinjection is not feasible in the densely urbanized City because it could destabilize existing buildings. The City of San Diego has refused to accept dewatering discharges into its sewer because these waters displace limited capacity for wastewater which requires treatment. Discharge into the City's sewer may not be desirable because it increases the burden on the City's collection and treatment system which is already in violation of Federal and State requirements (United States and State of California v. City of San Diego, (United States District Court, Southern District of California) Civ.No. 88-1101-B). In any event, we lack authority to compel the City to accept these wastes. There was a lengthy discussion of alternatives at the November 1989 workshop and Regional Board staff invited all workshop participants, including petitioner, to suggest alternatives. No feasible alternatives were suggested at the workshop or in later communications with the Regional Board. [FN12]

In the absence of alternative discharge points, prohibition of discharge to San Diego Bay would be tantamount to prohibition of all ground water cleanup activity and new construction in downtown San Diego. It has already been noted that ground water pollution is pervasive in downtown San Diego. Cleanup of this ground water is required by State law (Water Code Section 13304). Much of downtown San Diego has been designated as a redevelopment area, which means the local government has determined that the area is blighted and that encouragement of new development in the area is an important public interest (Health and Safety Code Section 33000 et seq.). It is common knowledge that the presence of polluted ground water beneath a property makes sale or development financing of that property difficult if not impossible. It has already been noted that some temporary ground water dewatering cannot be avoided for building construction in downtown San Diego.

Discharges in accordance with the General Permit are necessary to accommodate important economic and social development in the area in which San Diego Bay is located, and will be consistent with maximum benefit to the people of the State. If these discharges were prohibited, there would be unquestionable substantial adverse social and economic impacts due to inability to clean up severe ground water pollution and inability to redevelop downtown San Diego. The stringent effluent limitations in the General Permit, many at a level more stringent than the numerical water quality objectives in the EBE Plan, will adequately protect aquatic life and human health in San Diego Bay and assure that water quality degradation, if any, will be minimal.

Contention: The discharge should be prohibited because it is municipal wastewater and industrial process waters.

***6** Finding: The discharges under the General Permit are not municipal wastewater or industrial process waters as those terms are used in the EBE Policy.

The EBE Policy Prohibition 1 provides,

"New discharges of municipal wastewaters and industrial process waters (exclusive of cooling water discharges) to enclosed bays and estuaries, other than the San Francisco Bay-Delta system, which are not consistently treated and discharged in a manner that would enhance the quality of the receiving waters above that which would occur in the absence of the discharge, shall be prohibited."

The term "industrial process waters" is not defined in the EBE Policy, but this

Board discussed the meaning of the term in Order No. 88-4 as follows:

"[It] makes sense to construe "industrial process water" as a discharge which is a by-product or integral part of an industrial process. Storm water and other flows which are incidental to the operation of a business such as a boatyard, should not be covered." (emphasis added)

This interpretation is consistent with the EPA definition of "process wastewater" in 40 C.F.R., Section 122.2,

"any water which during manufacturing or processing, comes into direct contact with or results from the production or use of any raw material, intermediate product, finished product, by-product, or waste product." (emphasis added)

Ground water is being discharged in this case. This ground water may contain waste products which became dissolved in the water due to spills or leaks from gas stations or industrial facilities. But, like stormwater, the ground water did not contact these wastes "during manufacturing or processing". This ground water is not an "integral part of an industrial process". Therefore, the discharges under the General Permit are not industrial process water discharges.

Petitioner argues that some of the discharges permitted under the General Permit are municipal wastewater because at one time similar discharges were disposed of into the municipal sewer system. The term "municipal wastewater" is not defined in the EBE Policy. However, discussion regarding the discharge of municipal wastewater in the Appendix to the EBE Policy indicates that this term refers to discharges of treated sewage and industrial wastewater by public agencies and not to individual waste streams which are disposed of into municipal sewers. This interpretation is supported by Exhibit D of the Appendix which lists municipal wastewater discharges. The discharges on the list are all controlled by public agencies. This is also consistent with the EPA definition of "municipality" in 40 C.F.R., Section 122.2:

"a city, town, borough, county, parish, district, association or other public body created by or under state law and having jurisdiction over disposal of sewage, industrial wastes, or other wastes, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under section 208 of CWA."

***7** Contention: The monitoring program in the General Permit is inadequate because it does not require monitoring of the effects of the discharge on the sediments, the benthic community, the indigenous biota, or aquatic resources used for human consumption.

Finding: The following receiving water limitations are in the General Permit:

"The discharge of ground water from any site shall not, separately or jointly with any other discharge, cause violations of the following water quality objectives in San Diego Bay:

"1. Physical Characteristics

"d. The rate of deposition of solids and the characteristics of solids in San Diego Bay sediments shall not be changed such that benthic communities are degraded.

"2. Chemical Characteristics

"d. The concentration of substances set forth in discharge Specification B.1 in marine sediments shall not be increased to levels which would degrade indigenous biota.

"3. Biological Characteristics

"a. Marine communities, including vertebrate, invertebrate, and plant species, shall not be degraded." (General Permit pp. 10-11)

Petitioner asserts that the Regional Board cannot enforce these receiving water limitations unless each discharger monitors sediments and benthic life. However, direct monitoring of sediments and the benthic community is not the most appropriate method for determining compliance with these narrative receiving water limitations given the nature and character of the proposed discharges. Toxicity testing, including acute and chronic toxicity, should provide a reliable indicator of possible adverse impacts on aquatic life.

The need for benthic monitoring around discharge points is especially necessary when a dilution factor is assumed as a part of the permit. Benthic fauna monitoring is necessary to verify dilution factors and is dependent on the nature of the receiving waters, the discharge regime (e.g. intermittent, highly variable, or constant), the flow volume, the location of the discharge, and access. Without a reasonably constant discharge, it would be difficult to differentiate between adverse effects resulting from discharge constituents and those resulting from flow regimes. These difficulties can be compounded by the number of discharge locations. In this case, there is not a dilution factor in the General Permit and discharges are not constant but are variable and temporary. For these reasons, selection of an appropriate monitoring program must be left to best professional judgment (BPJ) to attain results to determine whether a discharge will or has adversely affected the biological integrity of the receiving waters.

As a zero dilution factor is assumed for discharges under this Permit, whole effluent toxicity would probably be a more reasonable water quality characteristic to monitor for this type of discharge. This measurement would provide a concentration which can be used as an index to judge whether a potential adverse effect exists. The General Permit presently contains an acute toxicity limit of 0.05 Tua as a six-month median and 0.59 Tua as an instantaneous maximum, based on BPJ, with no limit for chronic toxicity. An acute toxicity limit, as specified in the General Permit, of 0.59 Tua expressed as an instantaneous maximum translates into a test result of 90 percent survival of a test species in 100 percent effluent. The requirement of "no acute toxicity" is defined in the EBE Plan as a toxicity level where survival of the test organism in 100 percent effluent (undiluted) exceeds 90 percent for at least 50 percent of the time and survival is not less that 70 percent for less than 10 percent of the time in a 96-hour static or continuous-flow test.

***8** The EBE Plan sets an acute toxicity requirement of no toxicity and a chronic toxicity limit of 1.0 Tuc as a daily average. Thus, the General Permit's acute toxicity limit is stricter than that contained in the EBE Plan and should be retained. The monitoring and reporting program in the General Permit already provides for acute toxicity monitoring.

The General Permit contains no requirement for chronic toxicity. Because direct monitoring of benthic life is not required, the General Permit should include an effluent limitation of 1.0 Tuc toxicity so that a more accurate understanding of impacts on aquatic life can be obtained. Chronic toxicity monitoring can be performed at the same intervals for toxicity monitoring which are already provided in the General Permit.

Because these are intermittent and often relatively short term discharges, it would be difficult to determine their effect on the benthic community as compared to other factors affecting that community. The inclusion of a chronic toxicity effluent limitation and monitoring requirement in the Permit will provide a reasonable estimate of the long-term impacts of the discharges on marine communities and should be sufficient for these types of discharges.

Contention: The monitoring program in the General Permit is inadequate because effluent monitoring is too infrequent.

Findings: Petitioner asserts that testing for total petroleum hydrocarbons should be done more frequently. The General Permit provides for monthly monitoring for certain individual petroleum compounds: benzene, ethylbenzene, toluene and xylene (BETX). Total petroleum hydrocarbons are monitored only quarterly.

This monitoring schedule is appropriate. BETX molecules are more soluble and more transportable than other, larger hydrocarbon compounds. Therefore, they are more likely to be detected in water samples and are a greater threat to water quality. The detection levels for these substances is sufficiently low to assure detection of effluent limitation violations.

The petitioner is also concerned that there could be months of violations before detection under the monitoring schedule in the General Permit.

Prohibition A.7. and Reporting Requirement E.14. of the General Permit provide that each discharger must demonstrate how ground water is to be treated in order to comply with effluent limitations. It also permits the discharger to provide a contingency plan instead of providing treatment in advance of discharge. It is implicit in this requirement that the discharger must prove that the proposed discharge will comply with effluent limitations before starting discharge. This provision should be clarified to assure that ground water will be tested before discharge and that the discharger assesses possible sources of contaminants which might be intercepted by the dewatering system. This demonstration should cover all waste constituents listed in the General Permit. It should also include all waste constituents in Tables 1 and 2 of the EBE Plan unless the Regional Board determines with reasonable certainty that particular waste constituents are unlikely to be present in the discharge stream, or that a particular discharge is so low in volume that it will have no significant adverse impact on water quality. (EBE Plan, p. 10, memorandum from Edward Anton, Acting Chief, Division of Standards and Assessment, State Board to Robert S. Dodds, Assistant Executive Officer, Regional Water Quality Control Board, Lahontan Region, May 7, 1991). This would assure that the Regional Board had adequate information to determine the risk of contaminants in the discharge, determine which constituents are likely to be present, and determine the treatment system needed to comply with effluent limitations. Given this procedure in advance of discharge, the frequency of monitoring required in the permit is adequate.

III. SUMMARY AND CONCLUSIONS

***9** 1. There is not sufficient evidence on the record to permit discharges to tributaries to San Diego Bay.

2. San Diego Bay is a water quality limited segment because of high levels of copper, mercury, PCBs, and TBT. In order to comply with the Federal Antidegradation Policy and Resolution No. 68-16, effluent limitations in the General Permit for copper, mercury, and PCBs should be amended to water quality objective levels in the EBE Plan, and effluent limitations for TBT should be

added to the General Permit in accordance with water quality objectives in the EBE Plan.
3. The discharge of copper, mercury, PCBs, and TBT at levels required by the General Permit as amended will not degrade water quality in San Diego Bay.
4. The General Permit, as amended, does not violate the Federal Antidegradation Policy or State Water Resources Control Board Resolution No. 68-16.
5. The Regional Board adequately evaluated alternatives before adopting the General Permit.
6. A waste load allocation is not necessary before discharge to San Diego Bay of copper, mercury, PCBs, and TBT can be permitted at levels not exceeding water quality objectives.
7. The discharges permitted by the General Permit are not discharges of municipal wastewater or industrial process water.
8. Monitoring sediments and benthic life is not appropriate in this case; monitoring for acute and chronic toxicity should be required instead.
9. The monitoring schedule in the General Permit is adequate but the certification reporting requirement should be clarified and monitoring requirements for TBT and chronic toxicity should be added.

IV. ORDER

IT IS HEREBY ORDERED that
(1) The title of the General Permit is amended to read:
"General Waste Discharge Requirements for Ground Water Dewatering Discharges to San Diego Bay and Storm Drains or Other Conveyance Systems Tributary Thereto".
The location of discharges permitted under the General Permit is limited to San Diego Bay and storm drains or other conveyance systems tributary thereto.
(2) B. DISCHARGE SPECIFICATIONS, Table 1 on pages 9 and 10 of the General Permit are amended as follows:
a. For copper, add a 1-hour average of 2.9 ug/l
b. For mercury, add a 30-day average of .025 ug/l and a 1-hour average of 2.1 ug/l
c. For PCBs, add a 30-day average of .00007 ug/l
d. Add an effluent limitation for TBT of a 30-day average of .005 ug/l
e. Add an effluent limitation for chronic toxicity of 1.0 Tuc and a provision in accordance with Chapter III, Part D of the EBE Plan (1991).
(3) E. REPORTING REQUIREMENTS, Paragraph 14 on page 22 of the General Permit is amended by adding the following to the end of the paragraph:
"The report shall demonstrate, to the satisfaction of the Executive Officer, that the proposed discharge will comply with effluent limitations. The report shall include data from testing of groundwater which will be the source of the discharge and shall include a risk assessment of possible sources of contaminants which might be intercepted by the dewatering system. Testing shall be performed for all waste constitutents listed in this permit. Testing shall also include all waste constituents listed in Table 1 and 2 of the EBE Plan adopted by the State Water Resources Control Board unless the Executive Officer determines with reasonable certainty that particular waste constituents are unlikely to be present in the discharge stream or that a particular discharge is so low in volume that it will have no significant adverse impact on water

quality."
***10** (4) D. GROUNDWATER DISCHARGE MONITORING, on page 3 of the Monitoring and Reporting Program No. 90-31 is amended by adding requirements for monitoring tributlytin in units of ug/L by grab sample with a quarterly minimum frequency of analysis and a quarterly reporting frequency and by adding requirements for monitoring chronic toxicity by grab sample according to standards specified in the EBE Plan (1991) with a semiannual minimum frequency of analysis and a semiannual reporting frequency.
IT IS FURTHER ORDERED that in all other respects, the petition is denied.

FN1 The State Board and the Regional Boards are authorized to issue General Permits by EPA under 40 C.F.R., Section 122.28 (54 Fed.Reg. 40664). Pursuant to 40 C.F.R., Section 122.28, a General Permit may be issued to cover a category of point source discharges located in a specific geographic area if the sources all:
(a) involve the same or substantially similar types of operations;
(b) discharge the same types of wastes;
(c) require the same effluent limitations or operating conditions;
(d) require the same or similar monitoring; and
(e) are more appropriately controlled under a general permit than under individual permits.

FN2 Dewatering is a process by which ground water is actively pumped out and removed from an area at a rate greater than the rate of recharge.

FN3 The General Permit defines "permanent dewatering" as dewatering operations for structures which (1) are not designed or constructed to withstand hydrostatic pressure or do not preclude infiltration of ground water, and (2) require removal of ground water to prevent water infiltration to the structure(s). A project is a "new" permanent dewatering project if it had not submitted a complete report of waste discharge or applied for a building permit before the Order was adopted.

FN4 The petition contained numerous allegations which were not supported in petitioner's points and authorities. On June 12, 1990, State Board staff notified petitioner that the petition was incomplete because it lacked a statement of points and authorities. On June 29, 1990 petitioner submitted a statement of points and authorities. This Order addresses only those contentions covered in the statement of points and authorities. Any other allegations in the petition are deemed incomplete and are therefore dismissed.

FN5 The final portions of this regulation are not included because San Diego Bay has not been declared an outstanding national resource and thermal discharges are not at issue here.

FN6 Likewise, if effluent limitations for mercury, copper, TBT, and PCBs are set at water quality objectives, there is no need to establish a waste load allocation before these discharges are permitted.

FN7 The EBE Plan contains the following formula for calculating effluent limitations which applies to the facts in this case as follows:

Ce = Co + D(C0 - Cb), when Co>Cb, and Ce = Co, when Co<or = Cb,

Where Ce = the effluent concentration limit for the substance,

Co = the water quality objective for the substance to be met in the receiving water body,

Cb = the ambient background concentration of the substance in the receiving water body, and

D = the allocated dilution ratio, expressed as parts receiving water per part wastewater, based on mixing zone provisions.

Ambient background concentration (Cb) means the median concentration of a substance, in the vicinity of a discharge which is not influenced by the discharge. Ambient concentration shall be determined using analytical methods at least as sensitive as those used to determine compliance with effluent limitations.

FN8 The Regional Board has argued in its response to the petition that high levels of copper do not exist throughout the Bay but that they are found in isolated "hot spots". It is possible that "ambient background concentrations" of copper or other pollutants within the vicinity of a particular discharge may be less than water quality objectives. However, lacking evidence of which locations in the Bay may have ambient background concentrations which are less than water quality objectives and because the General Permit authorizes discharge throughout the Bay, the Regional Board determination that the entire Bay is water quality limited should be followed. However, individual NPDES permits or a General Permit which limits discharge locations may rely on site specific data, including but not limited to, ambient background concentrations of pollutants, and may contain effluent limitations calculated pursuant to alternatives authorized in the EBE Plan.

FN9 ug/l = micrograms per liter.

FN10 The State Board provides guidelines for an antidegradation analysis in the State Board's Administrative Procedures Update 90-004. These are recommendations and not regulations.

FN11 The effluent limitations in the Permit are sufficiently stringent to protect existing beneficial uses of the Bay, considering the temporary and variable nature of the discharges. With the exception of the effluent limitations for silver, the limitations in the General Permit will provide water quality protection which is as stringent or more stringent than the numerical water quality objectives for those constituents in the EBE Plan. This Order does not set an effluent limitation for silver because the record does not contain information regarding the Bay's assimilative capacity for silver. The adoption of the EBE Plan after the time that the General Permit was issued does not invalidate the General Permit. The Regional Board does have the power to review the General Permit and determine what changes, if any, should be made to bring it into conformity with the EBE Plan. (Water Code Section 13263(e)). The Regional Board should do so.

FN12 Petitioner contends that the Regional Board did not adequately evaluate alternatives. As noted here, there was substantial exploration of alternatives. This contention will not be discussed separately.

1991 WL 214438 (Cal.St.Wat.Res.Bd.)

END OF DOCUMENT

Citation | Found Document | Rank(R) 1 of 1 | Database
1992 WL 297157 CAENV-ADMIN
(Cite as: 1992 WL 297157 (Cal.St.Wat.Res.Bd.))

State Water Resources Control Board
State of California

*1 IN THE MATTER OF THE PETITION OF
ENVIRONMENTAL HEALTH COALITION AND EUGENE J. SPROFERA
ORDER NO. WQ 92-09
September 17, 1992

For Review of Cleanup and Abatement Order No. 85-91, Addendum No. 7, of the California Regional Water Quality Control Board, San Diego Region. Our File Nos. A-775 and A-775(a).

BY THE BOARD:

On December 9, 1991, the California Regional Water Quality Control Board, San Diego Region (Regional Water Board) adopted Addendum No. 7 to Cleanup and Abatement Order No. 85-91. Cleanup and Abatement Order No. 85-91 required Paco Terminals, Inc., the discharger, to cleanup and abate discharges of copper ore to the San Diego Bay. Addendum No. 7 amended Cleanup and Abatement Order No. 85-91 by relaxing the cleanup level of copper contaminated sediment in the San Diego Bay from 1,000 milligrams per kilogram (mg/kg) to 4,000 mg/kg. On January 8, 1992, the Environmental Health Coalition and Eugene Sprofera ("Petitioners") filed timely but incomplete petitions for review of Addendum No. 7. The Petitioners later supplemented the petitions and the petitions were deemed complete on April 24, 1992. The Petitioners' primary contention is that the 4,000 mg/kg sediment cleanup level does not comply with the State Water Resources Control Board's (State Water Board's) Water Quality Control Plan for the Enclosed Bays and Estuaries of California ("EBE Plan") and other Board requirements. [FN1]

I. BACKGROUND

In the late 1970s, Paco Terminals, Inc. (Paco Terminals) began conducting copper ore storing and loading activities at the National City Marine Terminal (NCMT) in San Diego, which it leased from the San Diego Unified Port District ("Port District"). The Regional Water Board issued permits to Paco Terminals (Waste Discharge Requirements Order Nos. 79-72 and 84-50, NPDES Permit No. CA0107930). The permits regulated the storage and loading of copper ore, prohibited the discharge of copper to the San Diego Bay, and required Paco Terminals to follow a best management practices plan to prevent discharges. In 1985, Regional Water Board staff inspected Paco Terminals' facility and discovered copper discharges to the Bay in violation of the permits. The Regional Water Board issued Cleanup and Abatement Order No. 85-91, naming Paco Terminals as the responsible party for the discharges. Order No. 85-91 was revised in 1989 to include the Port District as a responsible party. Both parties are hereinafter referred to as the "Dischargers." [FN2]

Cleanup and Abatement Order No. 85-91 required Paco Terminals to remove copper contaminated sediment to attain the background level of 110 mg/kg of copper in sediment in San Diego Bay and to attain a level of 5 micrograms per liter (ug/l)

(6-month median) copper in the water column. [FN3] In response to Order No. 85-91, Paco Terminals provided a report on the distribution of copper contaminated sediments, evaluated the effects of copper on the marine environment, and evaluated the cost and feasibility of cleanup alternatives. The report indicated that copper concentrations in the sediment near the NCMT pier face ranged from 2,300 mg/kg to 28,600 mg/kg. Copper concentrations in the water column ranged from 10 ug/l to 21 ug/l and copper concentrations in the interstitial water (the water between the particles that make up the bay bottom sediments) ranged from 80 ug/l to 480 ug/l (average 214 ug/l).

***2** Addendum No. 1 to Order No. 85-91, issued November 13, 1987, revised the Order. It required the Dischargers to reduce the sediment copper concentration in the affected portion of the San Diego Bay to a sediment copper concentration less than 1,000 mg/kg (dry weight). (Throughout this Order, the mg/kg levels are for dry weight copper.) The Regional Water Board based the cleanup level on several factors. The Board concluded that the benthic community in the area of NCMT was "impoverished" prior to the commencement of Paco Terminals' operations. It was therefore not possible to determine conclusively the impact of Paco Terminals' operations on the aquatic environment. The Board found, however, that data from the State Mussel Watch Program indicated that copper ore contaminated sediment significantly contributes to very elevated copper concentrations found in mussels in the area of Paco Terminals compared to mussels in other areas. Based on this data, the Board found that a significant amount of copper ore is migrating from the sediment into the water column. The Regional Water Board found that the copper contaminated sediment caused the exceedance in the water column of 5 ug/l, the level established in Order No. 85-91. The Board concluded that a sediment copper concentration of less than 1,000 mg/kg would attain 5 ug/l of copper in the water column and would protect the beneficial uses in the San Diego Bay.

Addenda Nos. 5 and 6 to Order No. 85-91 revised the schedules for compliance with the Order. In addition, they allowed the Dischargers to propose an alternate cleanup strategy, i.e., a less stringent sediment copper cleanup level, if they could demonstrate that a less stringent cleanup level would protect beneficial uses, comply with State Water Board Resolution 68-16 ("Statement of Policy With Respect to Maintaining High Quality of Waters in California"), EPA's Antidegradation Policy (40 C.F.R. 131.12), and with the State Water Board's most recent "Water Quality Control Plan for Enclosed Bays and Estuaries of California" (EBE Plan). The addenda also required the Dischargers to submit a report concerning the alternative of transporting copper contaminated sediment to a copper production facility for copper extraction (the "mining company option"). [FN4]

Based on their consultants' study of alternative cleanup strategies, the Dischargers requested that the Regional Board revise the cleanup level from 1,000 mg/kg to 4,000 mg/kg. The Dischargers' report analyzed remediation alternatives. The report designated two categories of sediments. Sediments near the NCMT contain copper in concentrations as high as 58,269 mg/kg. Level I consists of sediments containing greater than 1,000 mg/kg but less than 2,000 mg/kg copper (13,200 cubic yards). Level II consists of sediments containing greater than 2,000 mg/kg copper (9,800 cubic yards). The mining company option was identified in the report as the best alternative for disposal of the Level II materials. Options for the Level I material included ocean disposal, bulkhead disposal, and landfill disposal. [FN5] The Dischargers' report also concluded that the copper ore did not have an impact on beneficial uses in the San Diego Bay primarily because of the nature of copper ore. Unlike other types of copper discharged to the San Diego Bay (antifouling paints, etc.), the copper ore discharged from Paco Terminals is not expected to be toxic to aquatic organisms because in the oxygen free sediments it is expected to be stable, highly insoluble, and thus largely unavailable to affect aquatic life. Further, the copper ore tends to sink into the sediment so it is unavailable to most organisms. The Dischargers asserted in their response to these petitions that the EBE Plan does not apply to sediment cleanups in the Bay, but if it did the cleanup level of 4,000 mg/kg would not contribute to a violation of the 2.9 ug/l standard in the Plan.

***3** After a hearing, the Regional Water Board adopted Addendum No. 7 to Order No. 85-91 revising the cleanup level as proposed by the Discharger. The Board made findings, based on the additional technical information provided by the Dischargers, that 4,000 mg/kg copper is an appropriate sediment cleanup level. They found that the 4,000 mg/kg level would protect the beneficial uses of the Bay. Addendum No. 7 is the subject of the petitions.

Due to high levels of four pollutants, including copper, San Diego Bay is listed in the State Water Board's 1990 Water Quality Assessment as having impaired water quality and has been placed on several Clean Water Act-mandated lists of impaired water bodies. The beneficial uses that are considered impaired include shellfish harvesting and marine habitat. As this Board noted in State Water Board Order No. WQ 91-10, a "major source of copper pollution comes from copper ore deposits in the vicinity of Paco Terminal". [FN6] According to Regional Board staff estimates, if Paco Terminals were to comply with the 1,000 mg/kg cleanup level, four to five percent of the material it discharged to the Bay would be removed.

Cleanup and Abatement Order No. 85-91 has been the subject of several Addenda which amend the compliance schedule. Addendum No. 7 requires sediment removal to be completed by April 1, 1993.

II. CONTENTIONS AND FINDINGS [FN7]

1. Contention: The Petitioners contend that the revised cleanup level of 4,000 mg/kg will violate the EBE Plan, State Water Board Resolution 68-16, and other applicable requirements of the State and Regional Water Boards and request that the State Water Board reinstate the 1,000 mg/kg cleanup level.

Finding: The revised cleanup level of 4,000 mg/kg does not comply with the requirements applicable to cleanup and abatement orders under Water Code Section 13304 and it is likely to violate the EBE Plan, Resolution No. 68-16, and other requirements. The appropriate cleanup level is 1,000 mg/kg.

Order No. 85-91 was issued under Water Code Section 13304. Section 13304 requires that any person who has discharged or discharges waste into waters of the state in violation of any waste discharge requirement or other order or prohibition issued by a Regional Water Board or the State Water Board is required to cleanup and abate the effects thereof. This Board recently adopted State Water Board Resolution No. 92-49 which describes the policies and procedures that apply to the investigation and cleanup and abatement of discharges under Water Code Section 13304. As stated in Resolution 92-49, "dischargers are required to cleanup and abate the effects of discharges in a manner that promotes attainment of background water quality, or the highest water quality which is reasonable if background levels of water quality cannot be restored ...". [FN8] In setting the cleanup level, Water Code Section 13000 states that consideration should be given to "all demands being made and to be made on the waters and the total values involved, beneficial and detrimental, economic and social, tangible and intangible". Alternative cleanup levels less stringent than background must comply with State Water Board Resolution 68-18; not unreasonably affect present and anticipated beneficial use of such water; and not result in water quality less than that prescribed in the Water Quality Control Plans and Policies adopted by the State and Regional Water Boards. Order No. 85-91 requires compliance with these requirements.

***4** Water Quality Control Plans and Policies that apply to the situation at the NCMT include the EBE Plan [FN9] and State Water Board Resolution No. 68-16. The EBE Plan establishes narrative and numerical water quality objectives to ensure the reasonable protection of beneficial uses and the prevention of nuisance. The Plan states that discharges of waste shall not cause a violation of these objectives. The Plan contains the numerical water quality objective for copper in the water column of 2.9 ug/l (1-hour average). The Plan contains several narrative water quality objectives including the following: (1) "The concentrations of toxic pollutants in the water column, sediments, or biota shall not adversely affect beneficial uses." (2) "Enclosed bays and estuarine communities and populations, including vertebrate, invertebrate, and plant species, shall not be degraded as the result of the discharge of waste." The Plan does not establish numerical objectives for sediment. However, to comply with the Plan the sediment must not contain levels of copper that would cause the exceedance of the numerical objective in the water column or a violation of the narrative objectives.

State Water Board Resolution 68-16 states that existing water quality shall be maintained unless a change will be "consistent with the maximum benefit to the people, will not unreasonably affect present and anticipated beneficial uses of such water and will not result in water quality less than that prescribed in the policies". Discharges are required to meet requirements that will result in the best practicable treatment or control ...".

It is undisputed that the Dischargers violated the Waste Discharge Requirements and are therefore subject to Water Code Section 13304. Reports prepared by the Dischargers indicate that attainment of a cleanup level of 110 mg/kg (background) is not feasible because it would require removal of approximately 575,000 cubic yards of sediment. Removal of that much sediment would be extremely expensive and might have adverse impacts on the marine environment. Thus, an alternative cleanup level is appropriate.

This Board concludes that a cleanup level of 1,000 mg/kg would comply with the requirements described above. With regards to compliance with the EBE Plan, the record indicates that 1,000 mg/kg is the cleanup level that is most likely to attain the numerical standard in the EBE Plan of 2.9 ug/l (1-hour average). The record is not conclusive in determining what levels would comply with the narrative standards to protect beneficial uses contained in the EBE Plan. Information provided by the Petitioners indicates that several species of marine organisms suffer toxic effects where sediment levels are at or below 390 mg/kg. Further, the Regional Water Board concluded in Order No. 85-91 and Addendum No.

1 that data from the State Mussel Watch Program demonstrate that the copper contaminated sediment has affected the marine environment and that the contaminated sediment is continuing to discharge copper to the water column. The Dischargers assert that information from studies performed by their consultants demonstrate that the copper they discharged to the Bay is not toxic to aquatic life because it is stable, highly insoluble, and thus largely unavailable to affect aquatic life. They assert that even at levels as high as 19,800 mg/kg no impacts to aquatic life would occur. The conclusions reached by the Dischargers are not supported by their studies. The Dischargers' study contains no tests that would isolate copper as a contributing factor to the adverse effects investigated and does not evaluate the effects of copper at proposed cleanup levels. In general, the studies presented were designed to address whether the remediation site is adversely affected, but were not designed to discriminate among various concentrations of copper. [FN10] Thus, it cannot be concluded that a level of 4,000 mg/kg will comply with the EBE Plan requirements.

***5** Since the 1,000 mg/kg cleanup level is likely to comply with the 2.9 mg/l objective in the EBE Plan, that level would also comply with Resolution 68-16, which requires compliance with State and Regional Water Board plans and policies. [FN11] Other factors to be considered in determining the maximum benefit to the people, as required by Resolution 68-16, include the impacts of leaving contaminated sediment in the Bay. As noted above, the San Diego Bay is listed in the State Water Board's 1990 Water Quality Assessment as having impaired water quality due, in part, to high levels of copper. As this Board noted in Order No. WQ 91-10, a "major source of copper pollution comes from copper ore deposits in the vicinity of Paco Terminals." Due to high levels of copper in Bay Waters, the Bay has no assimilative capacity for copper. The Regional Water Board found in Order No. 85-91 that the failure to remove copper contaminated sediment to the 1,000 mg/kg level would impair the ability of the San Diego Bay to support the designated beneficial uses as other sources of pollution are eliminated. The record indicates that dredging is likely to occur in the vicinity of the NCMT in the future. Disposal of such contaminated dredged material is likely to be difficult since EPA has so far prohibited ocean disposal of such sediment from the NCMT. Leaving contaminated sediment in the Bay would unfairly shift the burden to others to dispose of the sediment.

The cleanup level of 4,000 mg/kg adopted by the Regional Water Board as proposed by the Dischargers does not comply with the applicable requirements. The Dischargers proposed the 4,000 mg/kg level based on several factors. As the Dischargers stated in the December 9, 1991, Regional Water Board meeting where the level was adopted, it was proposed because it is the level determined to be a hazardous waste for purposes of disposal in a Class I landfill under Title 22 California Code of Regulations. It is undisputed that the number is irrelevant for purposes of cleanup standards in the marine environment. As noted above, the Dischargers have not provided adequate information to establish that the 4,000 mg/kg level will protect beneficial uses. Other information in the record indicates that a level of 1,000 mg/kg will comply with the EBE Plan's numerical standard of 2.9 ug/l.

The Dischargers also assert that by adopting 4,000 mg/kg as the cleanup level they will save approximately $3.6 million in cleanup costs and that such economic concerns are appropriate to consider in setting cleanup standards. Economic considerations, while relevant to setting cleanup levels, are not the only factors. This Board stated in adopting Resolution No. 92-49 that economics is one factor to be considered in determining cleanup levels. [FN12] In this regard it should be noted that a 1,000 mg/kg level is well above the 110 mg/kg background level and would result in cleanup of only four to five percent of the contaminated sediment. To allow a further relaxation would violate applicable water quality control plans and policies of the State and Regional Water Boards. The Dischargers also state that agreements reached in negotiations between the parties to their lawsuits are contingent upon the 4,000 mg/kg level. Developing a cleanup level based on private negotiations between parties who will benefit by a less stringent cleanup level does not necessarily result in compliance with the applicable water quality requirements. [FN13]

***6** Cleanup efforts should be initiated as soon as possible consistent with Order No. 85-91. Nothing in this order precludes the dischargers from asking us for a modification of the cleanup standards provided that cleanup is proceeding and provided that any modification is based on additional testing and studies acceptable to State Water Board staff.

2. Contention: Petitioner Mr. Eugene Sprofera contends that the Regional Water Board improperly excluded him from presenting testimony at the hearing held to consider Addendum No. 7.

Finding: The Regional Water Board's action in refusing to allow Mr. Sprofera to present testimony at the public hearing violated the applicable regulations (23 California Code of Regulations Section 647, et seq.). The Regional Water Board staff's response to Mr. Sprofera's petition states that the Regional Water Board has since been advised about their misunderstanding of the rules. This error, however, was harmless in this situation since Mr. Sprofera provided his comments in his petition to this Board.

III. SUMMARY AND CONCLUSIONS

1. The cleanup level adopted in Addendum No. 7 to Cleanup and Abatement Order No. 85-91 does not comply with Section 13304 of the Water Code, the EBE Plan, and State Water Board Resolution 68-16.

2. The cleanup level that will likely comply with the applicable requirements is 1,000 mg/kg (dry weight) copper in the sediment.

III. ORDER

IT IS HEREBY ORDERED that:

1. Order No. 2 of Addendum No. 7 to Cleanup and Abatement Order No. 85-91 is revised to read:

"Paco Terminals and Port District shall reduce the sediment copper concentration in the affected portion of San Diego Bay to a sediment copper concentration less than 1,000 mg/kg (dry weight)."

IT IS FURTHER ORDERED that in all other respects, the petition is denied.

IT IS FURTHER ORDERED that the discharger may ask the State Water Board for a modification of the cleanup order provided that cleanup is proceeding consistent with Order No. 85-91 and provided that any request for modification is based on additional tests and studies acceptable to State Water Board staff.

FN1 The petitioners have filed two separate petitions that raise some similar issues. Where appropriate, issues specific to one of the petitions will be identified.

FN2 In 1989, the Regional Water Board adopted Addendum No. 3 to Order No. 85-91 adding the San Diego Unified Port District as a responsible party. The State Water Board affirmed Addendum No. 3 in Order No. WQ 89-12.

FN3 The requirements in Order No. 85-91 were based on the Water Quality Control Plan. Ocean Waters of California because the May 1974 Enclosed Bays and Estuaries Policy (EBE Policy) does not contain numerical water quality objectives. The Order required the Dischargers to remove copper contaminated sediment to levels that would attain the following levels in the water column; 5 ug/l (6-month median), 20 ug/l (daily maximum), and 50 ug/l (instantaneous maximum). The Enclosed and Estuaries Plan (EBE Plan), adopted in April 1991, includes the water quality objective for copper of 2.9 ug/l (1-hour average). Addendum No. 5 of Order No. 85-91 required the Dischargers to comply with the EBE Plan upon its adoption.

FN4 The mining company option is the result of negotiations between parties in state and federal lawsuits concerning the cleanup. Parties to the negotiations include Paco Terminals, the Port District, several mining companies that supplied the copper ore to Paco Terminals, manufacturers of equipment that malfunctioned during copper loading operations, and numerous insurance companies. The mining company option was suggested when the U.S. Environmental Protection Agency indicated that it would not permit ocean disposal of the copper contaminated sediment.

FN5 The report indicated that the cost of the mining option for Level II materials (greater than 2,000 mg/kg) is $3,790,000 and the cost for bulkhead disposal of Level II materials (1,000 to 2,000 mg/kg) is $1,250,000. Approximately $500,000 additional costs was common to all remedial options. Land remediation has already cost the Dischargers $1,300,000. The bulkhead option would require extending the wharf by building a new bulkhead and using the sediment as backfill to support the bulkhead. The ocean disposal option was rejected by the U.S. Environmental Protection Agency.

FN6 State Water Board Order No. WQ 91-10 concerned the regulation of discharges into the San Diego Bay from ground water dewatering activities in San Diego. The Order required that permits for these discharges be amended to add the water quality objectives in the EBE Plan for copper, mercury, and PCBs. A lawsuit was filed challenging Order No. WQ 91-10 and actions of the Regional Water Board in failing to establish total maximum daily loads, wasteload allocations, and load allocatrions for the San Diego Bay. Environmental Health Coalition v. State Water Resources Control Board, San Diego County Superior Court, Case No. 644648 (filed November 6, 1991).

FN7 Other contentions raised by petitioners are denied for failure to raise substantial issues. 23 CCR Section 2052(a)(i); People v. Barry, 194 Cal.App.3d 158, 339 Cal.Rptr. 349 (1987).

FN8 State Water Resources Control Board Resolution No. 92-49 (Policies and Procedures for Investigation and Cleanup and Abatement of Discharges Under Water Code Section 13304) was adopted in 1992 after issuance of Order No. 85- 91, including the Addenda. However, the policies relevant to this order and described in Resolution 92-49 existed prior to the Resolution. The Regional Water Board applied these policies in adopting Order No. 85-91.

FN9 The San Diego Bay is an enclosed bay within the meaning of the Enclosed Bays and Estuaries Plan.

FN10 See State Water Board Division of Water Quality Staff Report (Comments on the Woodward-Clyde Report on Copper Pollution at the National City Marine Terminal, San Diego Bay) (August 18, 1992). Generally, the Woodward-Clyde Report provides some support for a cleanup level of 1,000 mg/kg copper, some indication that 2,000 mg/kg copper should be considered, and no support for the proposed 4,000 mg/kg cleanup level. The Report contains no analysis concerning the 2.9 ug/l water quality objective, but does indicate that the water quality objective is regularly exceeded both in nearby locations and at the site.

FN11 Resolution 68-16 also requires the use of the "best practicable treatment or control of the discharge". There appears to be no dispute concerning the proposed method of removing the sediment or the capability of the proposed method to remove to the 1,000 mg/kg level. The State Water Board has interpreted Resolution 68-16 to incorporate the federal antidegradation policy, 40 C.F.R. s 131.12(a).

FN12 Water Code Section 13241, relied on by the Dischargers, allows economics to be considered in setting water quality objectives in water quality control plans. That section, however, does not apply to cleanup levels established under Section 13304. State Water Board Resolution No. 92-49 states that the financial and technical resources available to the discharger should be considered in determining schedules for the cleanup.

FN13 Obviously, a less stringent cleanup level will cost less to attain. The Dischargers stated in the record that the mining company option is feasible and the best alternative for sediments with copper concentrations greater than 2,000 mg/kg. They also suggested at least two feasible options for disposal of sediments with copper concentrations between 1,000 and 2,000 mg/kg. The current cost estimate for cleanup of sediments greater than 1,000 mg/kg ($7.5 million) is within the range contemplated by the Regional Water Board when the cleanup level was initially established at 1,000 mg/kg ($475,000 to $17 million). The Port District has stated that the estimated value of the copper ore concentrate handled by Paco Terminals was approximately $1.5 billion.

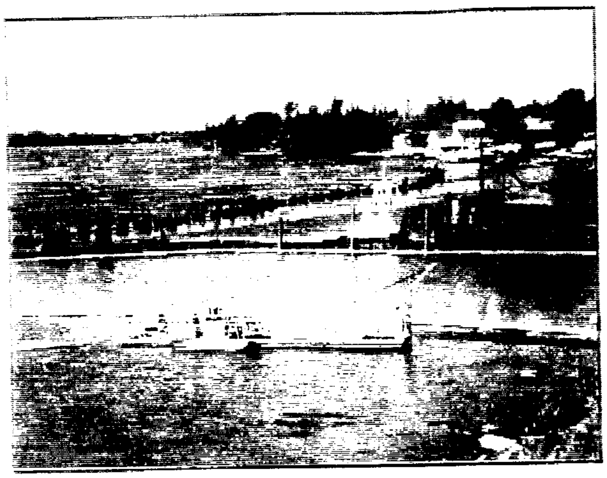
1992 WL 297157 (Cal.St.Wat.Res.Bd.)

END OF DOCUMENT

On

ENVIRONMENTAL DREDGING:

An Evaluation of Its Effectiveness in Controlling Risks

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August 2000

ENVIRONMENTAL DREDGING:

An Evaluation of Its Effectiveness in Controlling Risks

Introduction

This paper examines the role of environmental dredging in the efforts to reduce risks and protecting human health and the environment from chemicals in sediments. Bioaccumulative chemicals are a particular focus because reduction to levels acceptable to some regulatory agencies requires achieving low residual concentrations in water and sediments in contact with water. Achieving this goal now and in the future is problematic. It warrants careful analysis to determine which portion of the contaminants in sediments is bioavailable and an accurate assessment of the capabilities and limitations of the various remedial technologies, including dredging, to achieve these low levels. Despite increasing reliance upon dredging, to date there has been no systematic evaluation of how effective environmental dredging projects have been in controlling risks from contaminants in sediments. However, a sufficient number of projects have been undertaken that allow such an evaluation to be made, which provides an opportunity to learn what works and what does not.

To that end, this paper reviews major sediment remediation projects undertaken in the United States and summarizes key aspects of these projects, such as the objectives of the sediment remediation projects, the technologies being employed, and the capabilities and limitations of those technologies. Finally, recommendations are provided on needed programmatic change. Supporting documentation and project details are provided in the associated tables and appendices.

The key findings of this paper are:

- Dredging has become the "default" remedy for contaminated sediments.
- The current approach for evaluating the ability of dredging remedies to control risk lacks rigor and is not based on a sound scientific understanding of contaminant dynamics in aquatic systems.
- There has not been a systematic experience-based review of the capabilities and limitations of dredging technology in reducing risks posed by contaminated sediments. Thus, an opportunity exists to apply lessons learned from the current base of experience that can help guide future decision-making.
- Based on an evaluation of projects in the United States, we now have real information on the capabilities and limitations of dredging technology. The data on post-dredging residual contaminant levels in surface sediments, production rates, and costs need to be more rigorously used in the evaluation of dredging technology in sediment remedy decisions.
- While much effort is dedicated to evaluating risk posed by contaminated sediments, there has been no equivalent effort to evaluate risks from implementing remedies. No guidance is available on how to perform such evaluations nor on how to compare the potential benefits of a project to

the impacts. Given the potential impacts to local communities and the aquatic ecosystem, there should be confidence that the risk reduction benefits are real and out-weigh the adverse impacts. In general, risks from site contaminants are often overstated because they are based on conservative assumptions under the guise of the precautionary principle and typically assume unrealistic exposure scenarios for these risks.

The national sediment remediation program needs to incorporate these findings and recognize the technical limitations and inherent disadvantages of dredging. This will require a decisional framework that incorporates the considerations identified and discussed in this paper. It will also require coherent and thorough data collection and analysis. If conditions before and after a remedy are not measured, one cannot tell whether dredging has made conditions better or worse.

Background

Risk to human health and the environment from contaminants in sediments is a concern to both state and federal governments. Approximately 100 of the sites targeted for cleanup under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) involve aquatic-related contamination (NRC, 1997). The U.S. Environmental Protection Agency (EPA) estimates that about 10% of the sediment underlying our waterways, some 1.2 billion cubic yards, is contaminated and may need some form of cleanup or recovery effort (EPA, 1997a).

Dredging, including both wet and dry excavation, for environmental restoration ("environmental dredging") is increasingly used in an attempt to manage the risks posed by contaminated sediments. In contrast, the goal of navigational dredging, which has long been used to maintain waterways for commercial shipping and other maritime purposes, is to remove large volumes of sediments, not to reduce risk.

This paper evaluates current efforts by the government to manage risks from contaminated sediments in waterways, with particular focus on the effectiveness of dredging to control risks to human health and the environment – the method most commonly employed to control those risks. Although government policy states that the goal of sediment remediation is "risk reduction" to protect human health and the environment, this evaluation shows that cleanup decisions rarely contain a clear line of reasoning showing how the selected project will achieve these goals. Further, both government and private parties have failed to assess whether remedial efforts have been successful. Indeed, our review shows no evidence that sediment cleanups performed to date have effectively reduced risks to human health or the environment. Nevertheless, environmental dredging has become the default remedy for contaminated sediments. Most of the decisions appear to be based on the simple, yet largely incorrect, assumption that removing a percentage of the contaminant mass from the sediment will result in a roughly equivalent reduction in risks. This approach is referred to as "mass removal." Our review shows, however, that this approach is substantially flawed. Environmental dredging and the national program that increasingly promotes it, have not produced the risk reduction that is their central goal.

The information underlying this review is taken primarily from the Major Contaminated Sediment Sites (MCSS) Database, which was commissioned by General Electric Company (available at www.hudsonwatch.com). The MCSS database collects, for the first time, available information concerning remedies at the major contaminated sediment sites in the United States and elsewhere. The fact that such information has not been compiled before underscores one of the key points of this paper: in making decisions at contaminated sediment sites, regulatory agencies have evidently failed to examine what has actually been achieved at other sites and have not incorporated that experience into their decisions. This paper offers a review of experiences at several other sites and points to how this experience can be applied to develop a coherent framework for future decision-making based on the goal of effectively reducing risks to human health and the environment.

Understanding the Problem

An accurate understanding of contaminant fate in waterways is essential to devising an effective strategy to reduce risks posed by chemicals in sediment. We begin with a brief overview of how contaminated sediments create potential risks to human health and the environment. This involves two key concepts. First, it is only the contaminants within the biologically active, upper-most layer of the sediment bed that are available for uptake by sediment-dwelling organisms and fish or susceptible to migration downstream. Second, and a direct corollary to the first point, contaminants buried below the bioavailable zone present a risk only if the overlying sediment is subject to significant erosion or other mechanical disturbance, or if groundwater moves the contaminants upward through the sediments, thus creating the possibility that the buried contaminants might make their way to the surface and become bioavailable. Appendix A provides a more detailed review of sediment contaminant dynamics.

Consequently, if a buried chemical mass is stable and is not and will not become available to the water column or biota, the human health and ecological risks at that site will not be reduced by removing that mass. As obvious as this conclusion is, it is frequently overlooked because the greatest mass of contaminants is often found in buried sediments. It is important to remember that most of the contaminants in sediments are the result of waste disposal practices that began 50 to 60 years ago and largely ceased 20 to 25 years ago. The fact that the chemical mass remains buried 25 to 50 years after it entered the sediment is strong evidence that it is associated with stable sediments and is unlikely to migrate to the surficial bioavailable layer in any significant way. This explains why, at many sites, dredging has not been effective in reducing risks. Dredging is effective in removing sediment mass to, for example, clear a clogged navigational channel. However, removing chemicals that are not available to the food chain or the water column does not reduce risks. In fact, removing the surface layers may expose otherwise stable buried sediments with contaminants at higher concentrations, making them bioavailable and thereby increasing risks.

Thus, although targeting sediment deposits with the highest chemical concentration through dredging (mass removal) may intuitively make sense, thorough analysis to test this intuition is critical. When evaluating remedial options, it is necessary to evaluate both the sources of contaminants to the bioavailable surface layers and the capabilities of different technologies to reduce risks posed by contaminated sediments. The analysis begins with the identification of contaminant sources to the bioavailable surface. If the sources are unstable deposits subject to erosion, then the focus should be on finding and remediating these deposits. If the bioavailable surface layer is not receiving contaminants from elsewhere, then methods for accelerating the remediation of the surface layer should occur. If the chemicals in the surficial sediments come from on-shore sources, those sources must be controlled. A particularly important consideration, largely overlooked in previous decisions, is the inability of dredging equipment to achieve low levels of contaminants in the bioavailable surface sediments. Last but not least, one needs to compare the potential benefits from dredging (or any other remedy) against the potential harm to the ecosystem and risks to workers and communities. A large-scale dredging project can have devastating impacts on sensitive ecological habitats, and, like any large construction project, carries with it both significant risks to workers and disruption to local communities.

Only after all of these factors are considered can one make a reasoned, well-informed remedy selection. Unfortunately, our review indicates that regulators are not adequately taking these fundamental considerations into account. The bottom line is that a rigorous analysis of the contaminant source and fate in the aquatic system is required before an effective remedy can be evaluated and selected.

Current Regulatory Approach

Most contaminated sediment sites are subject to one of the federal or state cleanup programs, such as the federal CERCLA, commonly known as "Superfund," the federal Resource Conservation and Recovery Act (RCRA), or comparable state laws. Although differences exist among these laws, they all have the primary goal of ensuring that cleanups manage risks from contaminants so as to protect human health and the environment.

Although risk management is the stated goal of many sediment remedial projects, experience shows that dredging has become the default remedy for managing contaminated sediments, with little apparent consideration given to whether dredging actually reduces risks. The presumption appears to be that the dredging will effectively control risks even though objective analysis is usually not provided to support such a presumption. For example, of the 54 completed projects in the MCSS database (summarized in Table 1), 50 have used dredging or excavation:

Types of Remedies Implemented for 54 Completed Projects

Remedy Implemented	Times Selected
Dredging[1]	26
Wet/Dry excavation	24
Natural recovery/burial[2]	3
Engineered capping[3]	1

1 Includes diver-assisted/hand-held dredging.
2 Three others of the 54 have natural recovery as a component of the overall remedy.
3 Portions of two other sites were capped following removal due to elevated surface sediment concentrations.

For the purposes of this paper, dredging is defined as the underwater removal of sediments using mechanical (e.g., clamshell mounted on a barge) or hydraulic (e.g., cutterhead dredge) means. Diver-assisted dredging, which involves a diver removing sediments using a flexible suction hose connected to a land- or barge-based pump, is included under the dredging category. Wet excavation involves removal of underwater sediments using conventional excavation equipment (e.g., backhoe positioned on a barge or on shore). Dry excavation involves diverting water flow and dewatering the area targeted for removal. Once dewatered, the sediments are removed using conventional excavating equipment (e.g., bulldozers, backhoes).

It is not clear why dredging has become the default remedy at sediment sites because the basis for selecting dredging as the remedy is generally inconsistent and unclear. Table 2 provides a detailed summary of the stated goals, apparent or known basis for decisions, and reported outcomes relative to remedial goals and specific objectives for 25 sites having 10,000 cubic yards or more removed. A review of the MCSS database shows that decisions at sediment sites rarely are based on site-specific, quantitative analysis of risk. Instead, regulators often use default sediment clean up values or seek to remove a large mass of contaminants regardless of whether such approaches will actually reduce risk. The variability and absence of stated goals is symptomatic of the confusion surrounding sediment remediation and the absence of a clear and consistently applied decision-making framework.

Our analysis also shows that the agencies responsible for these decisions and for implementing or overseeing sediment cleanups have not implemented reasonably thorough programs to assess whether cleanup efforts have successfully reduced risks. Several years of high-quality and comparable data before and after remediation are essential to assess the effectiveness of sediment removal in reducing contaminant levels in fish and the associated reductions in contaminant bioavailability, exposure, and risk. An adequate sampling program, database, and evaluation methodology should include the ability to: 1) distinguish the effect of removal from the effects of other processes such as the natural burial, transport, or containment of chemicals, 2) reduce the uncertainties inherent in field sampling of biota, and 3) account for the long biological half-lives of strongly hydrophobic chemicals, such as PCBs, that can delay the response of fish tissue levels to changes in exposure. These important data are simply not available for virtually all of the sediment remediation projects compiled in the MCSS database. Even the relatively limited amount of data that does exist for a subset of projects does not indicate that the projects conducted to date have resulted in an acceptable level of risk control. What is particularly disturbing in light of this are recent claims by EPA regarding the success of dredging projects. In the March 7, 2000 update to an article originally appearing in *Engineering News Record* (Hahnenberg, 1999), it is stated: "Results from recent environmental remediation dredging projects demonstrate significant risk reduction is consistently achieved on environmental projects." (A detailed evaluation of EPA's claims can be found in Appendix C). Quite to the contrary, careful review of the existing data shows that: 1) dredging projects are not being carefully monitored and evaluated with respect to achieving risk reduction goals, and 2) where limited monitoring data are available, risk-reduction goals are not being achieved.

A Proposed Risk-Based Decision Framework

It is evident that a risk-based decision-making framework is needed. Such a framework would build from real-world experience at other sites and from an understanding of how contaminants in sediments have the potential to create risks to humans and the environment. This framework needs to answer the appropriate questions for remedial decision making and must be able to document through measurement whether stated remedial goals are achieved. With these concepts in mind, one can develop a simple and straightforward risk-based framework to guide decision making at sediment sites:

1. *Do chemicals present in bioavailable surface sediments pose an unacceptable risk to human health and the environment?*

2. *Are there active sources that are currently contributing contaminants to the surface sediments in quantities that cause unacceptable risks?* If these sources are not controlled or eliminated they will greatly reduce the likelihood that any remedy directed at contaminants already in the sediments will be successful.

3. *Do the chemicals of concern that are buried below the bioavailable surface sediments have reasonable potential to materially increase contaminant concentrations in the bioavailable surface sediments?* Contaminated sediments that are stable and isolated below the surface sediment and not likely to become exposed during future events, such as flooding, do not warrant active remediation.

4. *If the system and bed are stable, would any active remedial effort (e.g., dredging, capping) materially accelerate natural recovery?* Natural recovery is the benchmark against which remedial options must be measured.

5. *If the answer to 4 is yes, is the accelerated risk reduction outweighed by the potential adverse impacts to human health, the community, and the environment from implementation of the remedy?* Decisions should maximize risk reduction and minimize the negative impacts of remedial technologies on the ecosystem and local communities.

In answering these questions, evaluations of remedial options must be based on a comprehensive scientifically sound analysis:

- Decisions must be based on thorough site assessment that is derived from well-conceived, statistically valid monitoring programs that allow a thorough understanding of chemical sources and fate. Where appropriate, these data should be utilized to construct a quantitative site model that will allow for evaluation of remedial alternatives.

- Decisions must be based on a thorough evaluation of *all* sediment management options. Such evaluations must incorporate experience gained from other sites as to the engineering capabilities and limitations of remedial technologies and fairly evaluate the benefits of natural processes and administrative controls to manage risks.

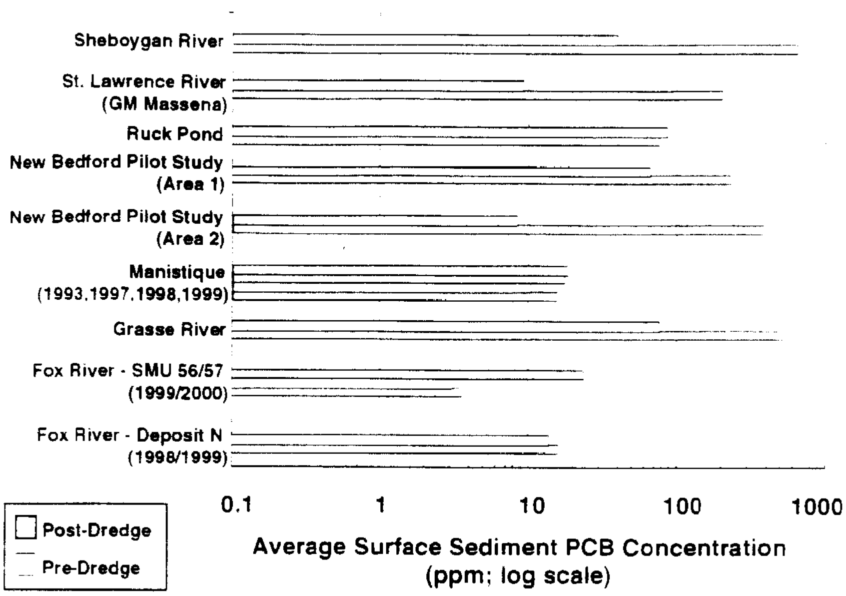
Observations from Environmental Dredging Experience

A review of available information from contaminated sediment sites shows that the environmental dredging projects implemented to date have been relatively small (compared with traditional navigational dredging), costly, and difficult to implement. Moreover, the projects typically have vaguely or inconsistently defined cleanup targets and goals, and their success in achieving risk control has not been documented or demonstrated.

Appendix B provides a summary of results from completed environmental dredging projects that have some post-dredging data available (e.g., contaminant levels in surface sediment, fish, and water). The MCSS database provides additional site information. The primary conclusions drawn from a review of these data are presented below.

1. Environmental dredging has not reduced surface sediment concentrations to acceptable levels.

Cleanup goals and their derivation vary considerably from site to site (i.e., 0.1 ppm to 4,000 ppm for PCBs). However, sediment cleanup goals selected by regulators for bioaccumulative chemicals, such as PCBs, typically are on the order of 1 ppm or less. However, experience has shown that PCB levels of 1 ppm or less have not been consistently achieved through dredging due to the limitations of dredging technologies. Average surface sediment PCB concentrations before and after dredging at several projects are plotted below.



This summary figure shows how dredging has failed to reliably and consistently reduce average surface sediment contaminant levels (PCBs in this case) to typical acceptable levels (i.e., 1 ppm or less). Left at the surface, these contaminants may be available for exposure to biota or movement into the water column.

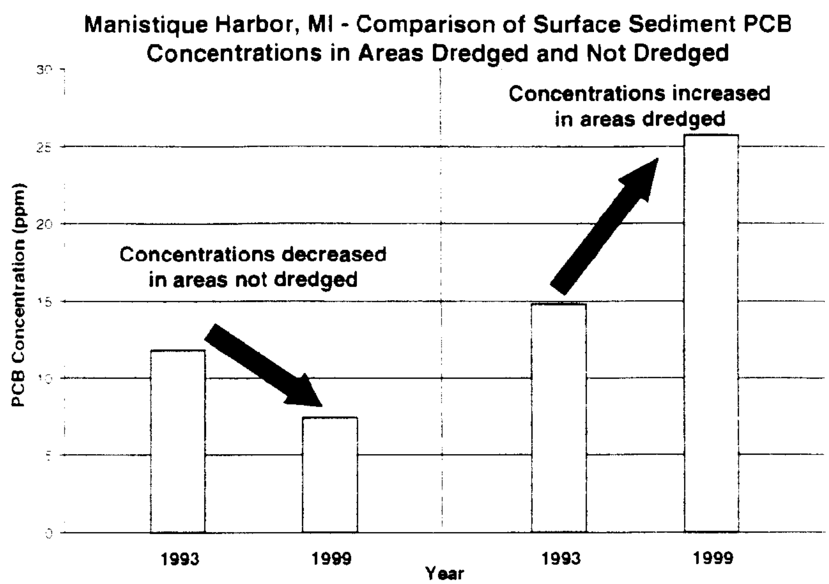
Source: MCSS Database

As can be seen, average PCB levels of 1 ppm or less have not been attained at dredging projects in the United States. At the St. Lawrence River in New York, the 1 ppm cleanup goal was not achieved in all six areas sampled; even though some locations were redredged up to 30 times, the average surface sediment PCB level after dredging was still 9.2 ppm. Similarly, after dredging at the Sheboygan River in Wisconsin and the Grasse River in New York (where the objective was to remove all sediment) average surface sediment PCB levels were 39 ppm and 75 ppm, respectively. At Ruck Pond on Cedar Creek in Wisconsin, the pond was dewatered and excavated "in the dry" in an effort to remove all sediment to the extent practicable. Extensive efforts were employed (e.g., squeegees used on a bulldozer blade, vacuum trucks), yet surface sediment averaged 81 ppm PCBs after removal efforts were finished. Based on the experience to date, it has not been demonstrated that dredging will consistently achieve less than 5 ppm PCBs in surface sediments. The central reasons for these poor results are discussed later in this paper in the section on "Technical Limitations of Environmental Dredging."

2. In some cases, dredging has resulted in increased surface sediment contaminant levels.

As shown in the figures below, dredging at Manistique Harbor in Michigan and the Fox River (SMU 56/57) in Wisconsin resulted in increases in surface sediment contaminant levels. At Manistique Harbor, the increase occurred despite three years of dredging. While the project is apparently not yet complete, it is doubtful that the trend set in motion by dredging (i.e., PCB levels progressively increasing, on average, since 1997) can be reversed by dredging alone. At both sites, conditions before dredging showed lower PCB concentrations at the sediment surface and the highest concentrations were observed in deeper sediment. In essence, dredging has exposed the buried sediments either directly or through sloughing in of the excavation wall, leading to increased surface sediment concentrations.

In Manistique Harbor, the average surface sediment PCB levels since 1993 have decreased in areas that have not been dredged, yet increased in areas that were dredged (see figure below and Fox River Group 2000b). This suggests that a natural recovery remedy would have resulted in greater risk reduction than dredging, and that dredging actually has increased potential risks.

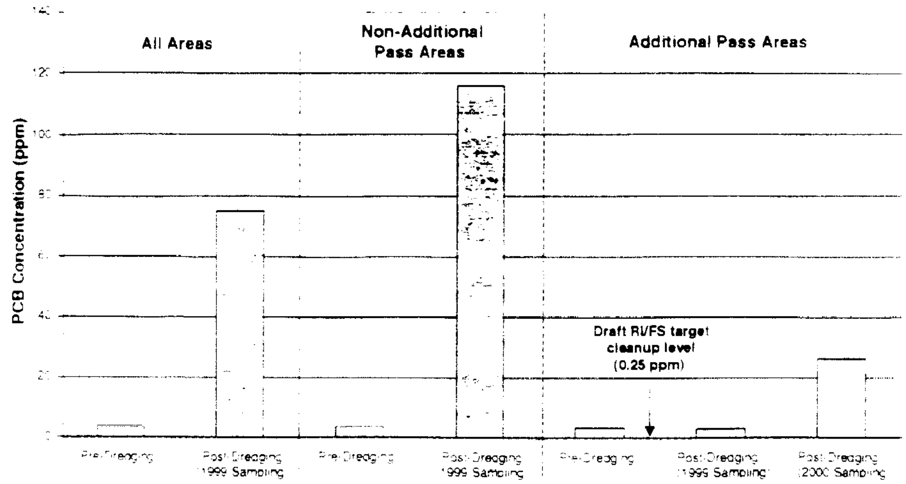


At Manistique Harbor, average surface sediment concentrations have declined since 1993 in areas where EPA has not dredged (i.e., data points outside dredging areas), but average concentrations have increased in areas where EPA has dredged since 1997 (i.e., data points within and bordering dredged areas). EPA has returned to the Harbor in 2000 for a fourth season of dredging.

Source: Fox River Group, 2000b

At the Fox River SMU 56/57 project, executed by the Wisconsin Department of Natural Resources in 1999, average surface sediment PCB concentrations were 3.6 ppm before dredging and 75 ppm after dredging. Due to schedule and budget constraints, only four small subareas were actually dredged "as designed" (i.e., with additional cleanup passes of the dredgehead). Samples obtained shortly after completion of dredging at these subareas showed average surface sediment PCB levels essentially unchanged (i.e., 3.5 ppm before and 3.2 ppm after dredging). However, as shown in the figure below, subsequent sampling conducted two months after completion of dredging (in early 2000) showed 26 ppm as the average surface sediment PCB levels in these areas.

Fox River, WI - SMU 56/57: Average Pre- and Post-Dredging Surface Sediment (0-4") PCB Concentrations



In late 1999, approximately 30,000 cy of PCB containing sediment were dredged from SMU 56/57 on the lower Fox River. Monitoring data for all areas dredged show that average surface sediment PCB concen-trations rose sharply after dredging. For a short period after dredging in areas where additional passes were used, certain subareas remained at pre-dredging average levels.

Source: Fox River Group, 2000a

3. Dredging has not been shown to lead to quantifiable reductions in fish contaminant levels.

As noted previously, collection of several years of high-quality and comparable data before and after remediation is critically important to assess the effectiveness of sediment removal in reducing contaminant levels in fish, and the associated reductions in contaminant bioavailability, exposure, and risk. These data are generally not available.

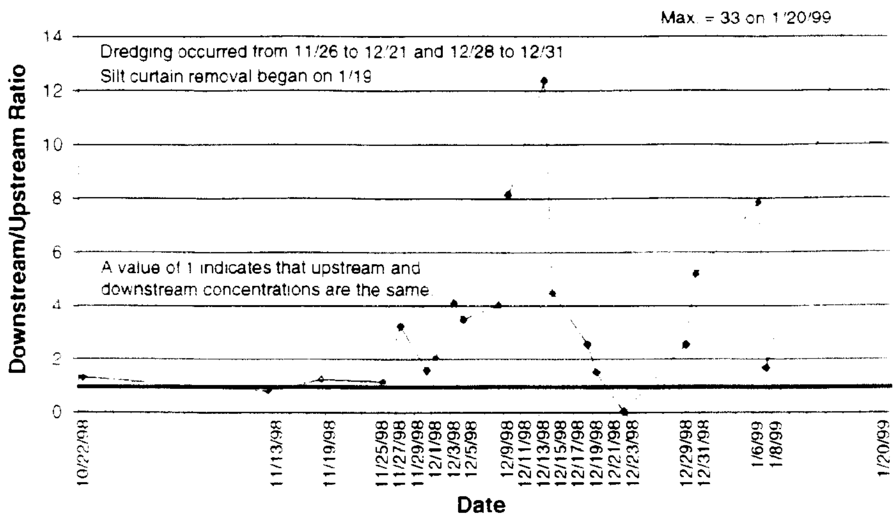
What data do exist are usually inadequate to assess whether dredging has reduced risks from contaminants in sediments. At the Waukegan Harbor site in Illinois, for instance, the pre-remediation fish tissue data consist of one measurement. At the Ruck Pond site, the pre-remediation study included fish cages that were disturbed and one that was lost completely. Pre- and post-dredging data for Ruck Pond are limited to data collected in only one event each. At Waukegan Harbor, where multiple years of carp data are available after dredging, an increasing trend is evident since the harbor was dredged. The uncertainties associated with these minimal monitoring data limit their utility for quantifying, and therefore demonstrating, whether reductions in fish contaminant levels were in fact achieved through dredging.

In addition, at several sites monitoring data collected before dredging indicate that natural processes were already reducing chemical concentrations in fish (e.g., Ruck Pond and Michigan's Shiawassee River), and at some sites other actions such as containment were taken (e.g., Waukegan Harbor, Sheboygan River, St. Lawrence River, Ruck Pond). Distinguishing the effects of these elements on fish levels from dredging is not possible. At the Sheboygan River and Grasse River sites, where several years of fish data are available after dredging, trends in fish levels are not evident in the vicinity of the removal actions. The data do not support the conclusion that dredging reduced fish contaminant concentrations. Appendix C presents additional discussion of this issue.

4. Dredging releases contaminants.

Dredging unavoidably resuspends sediment and releases associated contaminants in the water column. Silt containment systems have been employed at many of the dredging sites in an effort to contain the suspended solids. Although one might think that if suspended solids can be contained, associated contaminants could be as well, this is not always true. Again, there is a paucity of data to evaluate the importance of resuspension and the effectiveness of control. However, there are recent data from projects at the Grasse River and Fox River showing that although silt containment systems generally were effective in containing resuspended solids, increased PCB levels were observed downstream of the dredging (see figure below for Deposit N on the Fox River).

Fox River, WI - Deposit N 1998 Water Column Data:
Ratio of Downstream to Upstream Total PCB Concentration



This plot of the ratio between upstream and downstream surface water PCB concentrations in the lower Fox River during the Deposit N project shows that despite the use of silt curtains around the dredging area, PCBs were released to downstream waters during dredging.

Source: Fox River Group, 2000a

In Manistique Harbor, PCB levels in water in the vicinity of the dredging operation were orders of magnitude higher than pre-dredging levels, indicating PCBs were released during dredging (Appendix B).

When released to the water column, the bioavailability of contaminants increases. For example, minnows placed in stationary cages in the Grasse River showed significantly higher PCB uptake during dredging (20 to 50 times higher) and up to six weeks following dredging (2 to 6 times higher) compared with PCB uptake before dredging. These results, combined with the water data, demonstrate increased exposure and potential risks. Given the scarcity of post-dredging data, it is impossible to know how important these releases are in the long term. At a minimum, the release of contaminants will likely delay recovery of the system and therefore must be carefully considered. Further, as project size increases so does project duration, resulting in prolonged impacts.

Contaminants can also be released to the atmosphere during dredging. At the New Bedford Harbor, Massachusetts site, air monitoring documented elevated levels of PCBs downwind of the dredging operation, in some cases exceeding EPA's action level, requiring modifications to the dredge operation.

5. Environmental dredging projects are costly and take a long time to complete.

A common theme observed in evaluating completed projects is that environmental dredging projects generally take longer to complete and cost more than originally anticipated. This is extremely important since cleanup decisions rely heavily on these estimates in weighing and justifying various remedial alternatives. Consequently, *actual* schedule and cost information available from completed projects (see Table 1 and MCSS database) needs to be thoroughly considered when making cleanup decisions. A graphic example of this issue is the Manistique dredging program. In 1995, it was anticipated that the project would take two years to complete at a cost of $15 million. After five years of dredging the harbor and lower river, and expenditures growing beyond $39.2 million, the project is still not complete.

The costs for removal projects cover a wide range as shown in Table 1. Costs are highly variable due to: 1) differences in goals from project to project, 2) differences in production (i.e., removal) rates, which are influenced by a wide variety of site-specific variables such as ease of access, and 3) wide differences in disposal costs, which are influenced by disposal method and location and type of contamination. Average unit costs are summarized below, and a more complete list of factors influencing sediment removal costs is provided in Table 3.

- The average cost for the 22 dredging projects with available volume and cost information is $471 per cubic yard of material removed. The high overall cost is due to two primary factors: low dredging production rates and high costs for disposal. Additional factors that affect the performance of sediment removal are summarized in Table 4. There are a number of uncertainties that also can affect the success of a sediment removal project. Several of the more common uncertainties are also summarized in Table 4, all of which can impact effectiveness, cost, and schedule.

- The average cost for the 19 wet or dry excavation projects with available volume and cost information is $426 per cubic yard of material removed. The high overall cost reflects the low production rates compared with traditional earth-moving projects (using similar equipment) due to difficulties with accessibility and wet terrain, additional water management requirements for maintaining dry conditions, and high costs for disposal.

- Project duration and cost are heavily influenced by the effective production rates of environmental dredging (i.e., how quickly sediment can be removed). While the production rate is influenced by numerous site-specific factors, a review of completed projects shows that typical production rates of only 3,000 to 7,500 cubic yards per month have actually been achieved. These production rates are extremely low in comparison to navigational dredging, and extrapolation to large-scale projects involving hundreds of thousands of cubic yards of sediment indicate that such projects are likely to be decadal in duration.

6. There is limited environmental dredging experience in large rivers.

Almost all of the projects completed to date have covered limited areas and had relatively straightforward access. Of the 26 dredging projects in the MCSS database (i.e., not including wet/dry excavation projects), the largest project was at Bayou Bonfouca and involved only 169,000 cubic yards. In fact, two-thirds of the 26 projects involved removal of 40,000 cubic yards or less. In many of these smaller projects, access and space were available at a responsible party's property in close proximity to the areas to be dredged. This simplifies the implementation by eliminating the need to obtain access to unrelated properties, minimizing transport of sediment, and reducing the schedule and quantities that need to be removed, processed, and disposed of. In fact, projects where access to third-party properties has been required have experienced significant delays in implementation (i.e., Town Branch Creek in Kentucky and the Sheboygan River). For example, barges transporting removed sediment on the Sheboygan River had to travel relatively long distances between the removal areas and the limited number of available land-based access points. Also, shallow water limited the movement of equipment, making the operation inherently slow. In contrast, there is no experience with large-scale environmental dredging projects on extended rivers. With these larger projects, the access, waste management, and disposal issues are likely to be much more problematic. This means that experience at smaller rivers (in terms of ease of implementation) may not apply to larger projects.

7. Advances in dredging technology have been limited.

Specialty dredges, designed to overcome some of the shortcomings of conventional navigational dredges when applied to environmental dredging have their own limitations with respect to remediating large contaminated sediment sites. Japan and the Netherlands have been leaders in developing specialty dredging systems suitable for removing fine-grained contaminated material from harbor and lake bottoms with minimum resuspension. The availability of foreign-made specialty dredges is limited both by law (e.g., the Jones Act) and demand in the United States. Furthermore, their production rates are low compared with production rates of conventional hydraulic dredges. Also, specialty dredges typically have narrow or shrouded dredgehead openings that are particularly susceptible to plugging by debris or vegetation.

Actual production rate data for specialty dredges are sparse, and available data are poorly documented with respect to site conditions and dredge operating parameters. Further, specialty dredges are subject to the same inefficiencies and logistical difficulties as are conventional dredges for environmental dredging.

Of the specialty dredges listed in the table below, the Cable Arm environmental bucket has been used on three major environmental dredging projects in the United States, but it is relatively light-weight, and the absence of "digging" teeth limits its use to unconsolidated (soft) sediments only. In addition, as noted in the table, although minimizing resuspension is an intended feature, actual experience has shown that sediment resuspension with the Cable Arm bucket is still a concern. For the major environmental dredging projects implemented in the United States to date, conventional hydraulic cutterhead and horizontal auger dredges or mechanical clamshells have traditionally been used but with inconsistent results.

Features of Several Specialty Dredges

Dredge Type	Feature
Matchbox Cleanup Refresher	Shielded auger or cutterhead to reduce resuspension
Soli-Flo Versi AgEm	High solids, underwater pump located at dredgehead to shorten suction line and allow passage of large solids/objects
Cable Arm Watertight Dry DREdge	Environmental bucket to maximize percent solids and minimize resuspension upon impact and minimize losses to water column upon removal
Pneuma Oozer	Compressed air piston/cylinder pump to minimize resuspension and maximize percent solids

Technical Limitations of Environmental Dredging

Several technical limitations are inherent in environmental dredging. These limitations restrict the effectiveness of sediment removal in reducing contaminant levels in surface sediments. Although dredging can remove significant volumes of sediment and associated contaminant mass, dredging inevitably leaves behind residual materials at the sediment surface. These residuals are attributed to "missing," "mixing," and "messing," which are described below. In addition, dredging introduces new risks to the ecosystem and community.

Missing: Dredging cannot remove all targeted sediment and contaminants.

Even with careful operations, experience has shown that sediments are unavoidably left behind after dredging. According to the Army Corps of Engineers, "No existing dredge type is capable of dredging a thin surficial layer of contaminated material without leaving behind a portion of that layer and/or mixing a portion of the surficial layer with underlying clean sediment" (Palermo, 1991). Because surface sediments play a central role in transferring contaminants to fish and the wider food web, any action that leaves contaminants at the biologically-active sediment surface is unlikely to achieve risk-based goals requiring low part-per-million concentrations of chemicals.

Dredging's inability to reliably remove all sediments and contaminants and create a clean sediment surface results from various factors, including: 1) incomplete spatial coverage in dredged areas as evidenced by cratering of the sediment bed from the action of a mechanical clamshell or creation of windrows and furrows between swaths of a hydraulic dredge; 2) inaccessibility of sediments located in shallow waters where barges and hydraulic dredging equipment cannot operate effectively, located adjacent to or under boulders and debris that cannot be removed, or resting on an irregular hardpan or bedrock bottom; and 3) performing work underwater and out of sight of the operator.

Mixing: Dredging unavoidably mixes sediment targeted for removal with underlying materials.

To remove sediments, a dredge must cut into the sediment bed, which mixes sediments targeted for removal with other sediments either above or below the targeted material. Whether higher-concentration sediments are present at depth and cleaner sediments are present at the surface, or vice versa, the mixing caused by dredging inevitably leaves behind contaminated sediment on the new sediment surface created by the dredge. Many sediment sites have lower concentrations of the target chemical in surface sediments than at depth. This is often due to previous implementation of source controls and ongoing natural recovery through sedimentation and burial. Thus, dredging mixes the lower concentration surficial sediments with deeper, higher-concentration sediments, which can result in elevated residual concentrations at the new sediment surface. This is particularly problematic at sites with stable sediments because dredging does what nature cannot, bringing contaminants once sequestered in deep sediments to the surface and exposing them to biota and the water column. It also is problematic at sites where deeper, more contaminated sediment rests on bedrock because one cannot overcut into cleaner sediments beneath the contaminated layers. For example, this underlying bedrock condition exists at the Manistique Harbor site.

Messing: Dredging resuspends and releases contaminants into the water column.

The physical mixing action of the dredge inevitably stirs up sediments, releasing both suspended and dissolved contaminants to the water column. Although there are devices to reduce resuspension and the dredge operator can modify certain operating parameters such as production rate, no dredging method has totally eliminated local sediment resuspension. Sediment resuspended during dredging will eventually settle on the surficial layer of the area dredged or be transported and redeposited outside or downstream of the removal area. Thus, for contaminants with an affinity for binding to sediments, surface sediments both within and outside the removal area may become more contaminated than before dredging.

The transport of suspended sediments outside the removal area along with increased turbidity can cause a variety of adverse effects in fish, including interference with gill function, enhanced fungal infections of fish embryos, and reduced resistance to disease. In addition, certain chemicals that may be acutely toxic to local biota (e.g., metals, ammonia) may be released during dredging or result in anoxic conditions. Other chemicals released when the sediment bed is disturbed (e.g., nitrogen compounds, phosphorous) may degrade water quality by stimulating algal blooms.

To reduce the negative impacts of downstream sediment transport, environmental dredging areas are typically isolated from the rest of the waterway by a silt curtain or other containment barrier. These systems do not effectively control the transport of dissolved contaminants, and experience shows contaminants (especially in dissolved-phase) typically migrate outside the containment system and downstream (see examples in Appendix B). Once contaminants are dissolved in the water, they also are more apt to volatilize into the atmosphere.[1] Further, the more effective the barrier system is in containing resuspended sediment, the more contaminated sediment will resettle within the removal area. If sediments

[1]This situation was encountered at the New Bedford Harbor site where, according to EPA (1997b), "control of airborne PCB emissions did contribute to a slower rate of dredging and thus a longer project duration."

migrate outside the removal area, they can resettle over a larger surface area.[2] Chemicals in this resettled/residual sediment will be bioavailable, and the sediments will generally be more susceptible to scour than the pre-existing surface sediment since any natural armoring that may have occurred over time is removed during the dredging operation.

The impacts of resuspension are generally considered a short-term effect of dredging since most environmental dredging projects performed to date have been of limited duration. However, for large-scale, long-term dredging projects, the cumulative effect of these "short term" impacts could be substantial and must be considered in remedial decision-making.

Dredging introduces new risks to the ecosystem and community.

In 1995, EPA posed the question, "How can dredging affect the environment?" The Agency's response was that "impacts can include benthic disturbance, water quality degradation, impacts on aquatic organisms, and water and soil contamination from disposal of dredged materials" (EPA, 1995). EPA was right. Environmental dredging operations bring with them a myriad of risks and impacts not directly related to what is happening at the sediment surface. For example, dredging can destroy important ecological features of a site, such as vegetation, the benthic environment, and various fish spawning and nursery habitats, not to mention the communities of biota that inhabit the removal areas. Although some reconstruction of habitat can be attempted, impacts are typically observed until recolonization occurs, which may take years. As observed by Suter (1997), "the ecological risks related to remedial activity must be balanced against risks associated with the contaminant to the ecosystem components and against often hypothetical health risks." Unfortunately, these impacts are seldom evaluated with any rigor on environmental dredging projects despite the fact that they are carefully analyzed on proposals for navigational dredging projects.

In addition, environmental dredging operations, on-shore sediment handling and processing equipment (e.g., dewatering, treatment), and transportation of materials (via pipeline, barging, conveyance, trucking) to treatment or disposal facilities are inherently dangerous processes. Environmental dredging operations invariably cause normal commercial shipping and recreational boating near a site to become more hazardous and difficult or restricted. Indeed, large-scale environmental dredging projects could take decades and severely impair portions or all of a waterway during active operations. Such disruptions can have devastating economic impacts on a local community's use of the waterway for tourism or other commercial purposes. Again, the impacts from these types of projects in terms of injuries to workers and community members are real, not hypothetical.

As part of the planning process for all types of dredging projects, the Army Corps of Engineers evaluates the potentially detrimental effects of dredging on habitat to ascertain whether dredging must be confined to specific time periods to minimize its adverse environmental impacts. The most persistent concerns are: 1) disruption of avian nesting activities and destruction of bird habitat, 2) sedimentation and turbidity issues involving fish and shellfish spawning, 3) disruption of anadromous fish migrations, 4) entrainment

[2] Studies of the Yazoo and Yalobusha Rivers in Mississippi indicated that turbidity plumes extended up to one-half mile downstream of dredging activities, even when containment measures were utilized (Wallace, 1992). Similar evidence was noted at the New Bedford Harbor site as discussed in Appendix B.

of juvenile and larval fishes, 5) burial and physical destruction of protected plants, and 6) disruption of recreational activities (Dickerson et al., 1998). It is sensible and prudent to consider and weigh the potential damage to habitat and disruption to ecosystem structure and functioning against whatever environmental benefits might accrue from removal of contaminated sediments.

Clear guidance is needed on the evaluation of actual risks to ecological resources and communities resulting from implementation of environmental dredging projects and how to balance these risks and impacts relative to any benefits achieved in risk reduction. Currently, detailed guidance does not exist on how to evaluate objectively and quantitatively the negative consequences of sediment remediation projects.

Final Observations and Recommendations

Dredging has historically been used to remove bulk sediments from shipping channels and harbors. It is effective for that purpose. Dredging to reduce risks posed by contaminated sediments is relatively new, and its effectiveness has not been demonstrated. When viewed in the context of risk reduction, there is no sound justification for dredging stable, isolated sediments that contain contaminants that are not and will not migrate to the bioavailable surface sediment layer in any meaningful way. Decision makers often have not recognized the technical limitations of dredging and its potential for adverse ecological and community impacts. If this does not change, the contaminated sediment program will fall short of its goal of effectively reducing risks to human health and the environment. A number of conclusions can be drawn based upon our review of sediment remediation projects undertaken in the United States.

- There is no consistent framework for making cleanup decisions at contaminated sediment sites. The goal of any program should be to effectively control risks. There is a need for a clear, simple-to-apply, risk reduction decision framework. This paper proposes such a framework, which is based on an understanding of sediment dynamics using sound scientific principles.

- Appropriate data-collection programs to acquire the data necessary to measure the effectiveness of remedial techniques in adequately reducing risks at sediment sites have not been developed. As a result, substantial experience cannot be properly incorporated into remedial decisions. This paper and the MCSS database should help fill this gap.

- The limited available data clearly show the limitations of environmental dredging technology:

    - Dredging has not reliably and consistently removed all sediment, restored a "clean enough" sediment surface, or decreased the bioavailability of contaminants. Dredging is unable to reliably and consistently achieve low residual concentrations typically sought in surface sediments, even after repeated passes with the dredging equipment. The residuals left behind after dredging may be at a higher concentration and more bioavailable than before dredging, resulting in increased risk.

    - While environmental dredging typically employs controls to prevent resuspension and release of contaminants during operations, such releases to water, biota, and air occur.

These releases can create unacceptable long-term risks due to redeposition of resuspended sediment and are particularly problematic at large projects, where such releases may occur over a multi-year implementation period.

- Dredging removes material that must then be handled and processed, typically on shore. This can increase the complexity of remediation. Dredging is inherently dangerous, a fact verified by insurance statistics and poses serious short-term risks to workers and the community, and long-term risks to the extent the material must be permanently managed in a disposal facility. Dredging will disrupt or destroy the habitat and biota in the areas in which it is applied. These very real impacts and risks imposed by the remedy need to be balanced against the hypothetical risks posed by the sediment itself.

- Environmental dredging projects are costly and take a long time to complete.

Decision makers should select remedial alternatives that are protective, technically feasible, and cost-effective. Other options can be more effective than dredging with fewer negative impacts. Based on the evidence presented in this paper and supporting documents, we offer the following recommendations regarding how environmental dredging should be viewed in managing risk:

- Regulators need to reaffirm that risk reduction is the proper goal of any remedial action.

- How contaminants move in the aquatic system must be evaluated during risk analysis and remedy selection. Risk reduction in aquatic systems is directly linked to a remedy's ability to decrease the probability that fish and other biota are actually or potentially exposed to sediment-bound contaminants. The first step is to control or eliminate active sources of contaminants to the surficial bioavailable sediments. The second step is to evaluate sediment deposit stability to assess whether normal erosion or some extreme events (e.g., high flows, flooding) could mobilize otherwise isolated contaminants being currently buried, thus moving non-bioavailable chemicals into the surface sediment layer. The final step is to evaluate methods to reduce surface concentrations of the contaminants now and in the future so as to minimize their bioavailability. Fair consideration must be given to less disruptive risk controls like natural recovery and administrative controls (e.g., fish consumption advisories).

- Regulators must recognize the technical limitations of dredging that result in the inability of dredging to reliably and consistently achieve low residual contaminant concentrations in surface sediments. They must consider the new and potentially higher risks that might occur from increases in contaminant concentrations in surface sediment, the water column, and ultimately fish tissue concentrations.

- Regulators must consider the real environmental and human impacts of environmental dredging projects. These impacts must be weighed against any hypothetical reduction in risk that might be achieved. Comprehensive policy and guidance in this area are needed.

- The experience at completed projects needs to be considered in making future decisions. Adequate monitoring data and formal plans for pre- and post-remediation evaluation of risk reduction are essential elements in sediment remediation projects. These types of essential data can reduce uncertainty and allow one to draw sound conclusions regarding the relative effectiveness of remedial activities.

- Regulators must thoroughly consider *actual* schedule and cost information available from completed projects and incorporate this into their decisions. Experience shows that projects completed to date generally have taken longer to complete and cost more than originally anticipated.

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Tables

Table 1
Summary of Remediated Contaminated Sediment Sites

Project	USEPA Region	Setting	Contaminant Of Concern	Methods of Remediation and Disposal	Volume Removed (cy)	Total Cost (millions)	Total Unit Cost ($/cy)
Baird & McGuire, MA	I	3-mile sector of the Cochato River and several tributaries	As, DDT, chlordane, PAHs	Dry/wet excavation; on-site incineration[1]; natural recovery	4,712	$0.9[1]	$191
Bayou Bonfouca, LA	VI	Turning basin and 4,000 ft. of bayou	PAHs	Mechanical dredging; on-site incineration	169,000	$115	$680
Black River, OH	V	Two hotspots totaling 8 acres	PAHs	Hydraulic dredging and mechanical dredging; on-site landfill	60,000	$5	$83
Bryant Mill Pond, MI	V	22-acre 2,500 ft. long Bryant Mill Pond area of Portage Creek	PCBs	Dry/wet excavation; on-site former dewatering lagoons	165,000	$7.5[4]	$45
Cherry Farm, NY	II	Approximately 1,600 ft. of shoreline (full length of site) extending about 150 ft. into river	PAHs	Hydraulic dredging; on-site existing disposal pond	42,445	$2.2	$52
Convair Lagoon, CA	IX	10-acre embayment	PCBs	Engineered three-layer cap over 5.7 acres	N/A	$2.75[3]	N/A
DuPont Newport Plant, DE	III	1.5-mile sector of the Christiana River	metals (Pb, Cd, Zn); solvents	Mechanical dredging; on-site landfill disposal	10,000	Not available	—
Duwamish Waterway, WA	X	Slip	PCBs	Divers (hand-held dredging techniques); pneumatic dredging; off-site disposal ponds	10,000	Not available	—
Eagle (West) Harbor, WA	X	Puget Sound Embayment comprising about 200 acres of West Harbor	mercury, PAHs	Mechanical dredging, wet excavation, thin-layer capping, and enhanced natural recovery; nearshore CDF, commercial landfill, and *in situ* capping	3,000	$3	$1,000
Ford Outfall, MI	V	2.6 acre nearshore area (about 750 ft. long by 150 ft. wide)	PCBs	Mechanical dredging, on-site landfill	28,500	$5.65	$198
Formosa Plastics, TX	VI	1.1 acres (about 150 ft. by 350 ft.) in corner of an active turning basin	EDC	Mechanical dredging; commercial landfill	7,500	$1.4	$187
Fox River, WI (SMU 56/57)	V	9-acre depositional area in river	PCBs	Hydraulic dredging; commercial landfill	31,000	$9	$290
Fox River, WI (Deposit N)	V	approximate 3-acre depositional area	PCBs	Hydraulic dredging; commercial landfill	8,175	$4.3	$525
Gill Creek, NY (DuPont)	II	250-ft. sector of Gill Creek near its confluence with Niagara River	PCBs, PAHs	Dry/wet excavation; commercial landfill	8,020	$12[3]	$1,496
Gill Creek, NY (Olin Industrial Welding Site)	II	About 1,800 ft. in length of Gill Creek bed	BHCs, PAHs, mercury	Dry/wet excavation; use as on-site fill material	6,850	not available	—
GM (Massena), NY	II	11-acre, 2,500 ft. long nearshore area in the St. Lawrence River	PCBs	Hydraulic dredging, wet excavation, and capping; commercial landfill[1]	13,250	$10[1]	$755
Gould (Portland), OR	X	3.1-acre East Doane Lake remnant, a shallow impoundment	PAHs	Hydraulic dredging; on-site landfill	11,000	$3	$273
Grasse River, NY	II	1-acre nearshore hot spot in river	PCBs	Hydraulic dredging, wet excavation, and diver-assisted; on-site landfill	3,000	$4.9	$1,633
Hooker (102nd Street), NY	II	25 acres in an embayment in the Niagara River	VOCs, metals	Dry/wet excavation; on-site landfill	28,500	not available	—
Housatonic River, MA	I	550-foot sector of the river	PCBs	Dry/wet excavation; commercial landfill	6,000 sediment and banks	$4.5	$750
James River, VA	III	81-mile long estuary; 0.6 to seven miles in width	Kepone	In situ; natural recovery	N/A	N/A	N/A

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Summary of Remediated Contaminated Sediment Sites

Project	USEPA Region	Setting	Contaminant Of Concern	Methods of Remediation and Disposal	Volume Removed (cy)	Total Cost (millions)	Total Unit Cost ($/cy)
Lake Jarnsjon, Sweden	N/A	62-acre lake (bank-to-bank removal)	PCBs	Hydraulic dredging; on-site dedicated landfill	196,000 cy	not available	$33
Lavaca Bay, TX	VI	One deep and one shallow bay area comprising about 7 acres	mercury	Hydraulic dredging; on-site existing disposal ponds	80,000	not available	—
LCP Chemical, GA	IV	13-acre tidally-influenced marsh area; one-half mile of an outfall channel; a separate natural drainage channel	PCBs, mercury	Wet excavation; bucket-ladder dredge; commercial landfill	25,000	$10	$400
Lipari Landfill, NJ	II	18 acres of Alcyon Lake; 5 acres of Chestnut Branch Marsh; Chestnut Branch Stream	multiple organics, inorganics	Dry/wet excavation; some thermal desorption and beneficial reuse; some stabilization and placement	163,500	$50	$306
Loring AFB, ME	I	>2,500 ft. long Flightline Drainage Ditch; 15-acre Flightline Drainage Ditch Wetland (about 2,000 ft. by 400 ft.); >2,500 ft. long East Branch Greenlaw Brook	PCBs, PAHs	Dry/wet excavation; on-site landfill	162,000	$13.85	$85
Love Canal, NY	II	About 10,000 linear ft. of Black and Bergholtz Creeks	TCDD	Dry/wet excavation; commercial incineration[1]	31,000	$14[1]	$452
LTV Steel, IN	V	3,500 ft. of intake flume (width ranges from 96-467 ft.)	PAHs, oils	Hydraulic dredging and diver-assisted removal; commercial landfill	109,000	$12	$115
Mallinckrodt Baker, NJ (formerly J.T. Baker)	II	Nearshore hotspot (about one-half acre) in the Delaware River	DDT	Dry/wet excavation; on-site landfill	3,750[2]	$1.2	$320
Manistique River, MI	V	One 2-acre hot spot in dead-end and back water area; two other hot spots: one of 2 acres in the river and one of 15 acres in the 97-acre harbor	PCBs	Hydraulic dredging, commercial landfill	97,050	$35.9	$370
Marathon Battery, NY	II	200 acres of open cove and a small cove in the Lower Hudson River	cadmium	Hydraulic dredging and mechanical dredging; natural recovery; commercial landfill	77,200	$10[3]	$130
Marathon Battery, NY[5]	II	340 acres of backwater marshes and sheltered cove	cadmium	Dry/wet excavation; commercial landfill	23,000	not available	—
National Zinc, OK	VI	5,300 ft. of the north tributary (unnamed) of Eliza Creek	PCBs	Dry/wet excavation; commercial landfill	6,000	not available	—
Natural Gas Compressor Station, MS	IV	2-mile length of Little Conehoma Creek	PCBs	Dry excavation; commercial landfill	75,000 (includes floodplain soils)	not available	—
New Bedford Harbor, MA	I	Five acres of hot spots in the estuary	PCBs	Hydraulic dredging; commercial landfill[1]	14,000	$20.1[1]	$1,436
Newburgh Lake, MI	V	105-acre man-made lake	PCBs	Dry/wet excavation; commercial landfill	588,000	$11.8	$20
N. Hollywood Dump, TN	IV	40-acre man-made lake adjacent to the Wolf River	pesticides	Hydraulic dredging; on-site burial in an isolated oxbow	40,000	$2.4	$60
Ottawa River (Unnamed Trib.), OH	V	Unnamed tributary about 975 ft. long and 90 ft. wide at its mouth, and tapering to 10 ft. wide at its origin	PCBs	Dry/wet excavation; commercial landfill	9,692	$5	$516

Table 1
Summary of Remediated Contaminated Sediment Sites

Project	USEPA Region	Setting	Contaminant Of Concern	Methods of Remediation and Disposal	Volume Removed (cy)	Total Cost (millions)	Total Unit Cost ($/cy)
Pettit Creek Flume, NY	II	One-acre cove in the Durez Inlet of the Little Niagara River	DNAPLs (VOCs and semi-volatiles)	Diver-assisted dredging portion to commercial hazardous waste landfill	2,000	not available	—
Pioneer Lake, OH	V	200 ft. x 240 ft. (depth 0.5 to 3 ft.) area of southern lake	PAHs	Hydraulic dredging, commercial landfill	11,100	$2.5	$225
Queensbury NMPC, NY	II	An area of the Hudson River extending 180 ft offshore and 800 ft. downstream from site	PCBs	Dry/wet excavation, commercial landfill	4,750[2]	$3.5	$737
Ruck Pond, WI	V	800-1,000 ft. long by 75-100 ft. wide impoundment in Cedar Creek	PCBs	Dry/wet excavation, commercial landfill	7,730	$7.5	$970
Sangamo-Weston, SC	IV	7-mile sector of Twelvemile Creek and 730 acres of Lake Hartwell	PCBs	In situ; enhanced sedimentation and natural recovery	N/A	N/A	N/A
Selby Slag, CA	IX	Nearshore area of about 17 acres (fronting on 61.5 acres of shoreline and extending into the water about 280 ft.)	lead	Mechanical dredging; on-site disposal as fill	101,000[2]	$2.1	$21
Sheboygan River, WI	V	17 small hot spot areas in the upper 3.2 miles of river immediately downstream of the PRP site	PCBs	Mechanical dredging, wet excavation, and capping; on-site storage (temporary)	3,800	$7[1]	$1,842
Shiawassee River, MI	V	A 1.5 mile stretch of the South Branch of the Shiawassee River	PCBs	Dry/wet excavation; commercial landfill	1,805	$1.3	$720
Starkweather Creek, WI	V	About 1 mile upstream of the confluence of the east and west branches of Starkweather Creek	mercury (primary); also lead, zinc, cadmium, and oil and grease	Dry excavation; on-site disposal in former dewatering lagoons	15,000	$1.0	$67
Tennessee Products, TN	IV	2.5-mile sector of the Chattanooga Creek	coal tar	Dry/wet excavation; off-site fuel source and commercial landfill	24,100	$12	$498
Town Branch Creek, KY	IV	3.5-mile sector of the Town Branch Creek	PCBs	Dry/wet excavation; commercial landfill	17,000 (sediment and banks); 76,000 (floodplains)	$11	$118
Triana/Tennessee River, AL	IV	11-mile stretch of two tributaries of the Tennessee River	DDT	Rechannelization and *in-situ* burial	N/A	$30	N/A
United Heckathorn, CA	IX	Lauritzen Channel ~1,600 ft long by 200 ft wide; Parr Canal about 1,000 ft. long by 70 ft. wide	DDT	Mechanical dredging; commercial landfill	108,000	$7.5[4]	$69
Velsicol Chemical (Pine River), MI	V	3-acre hot spot in St. Louis Impoundment	DDT, HBB, PBB	Dry excavation following stabilization; commercial landfill	35,000	$7.8	$246
Waukegan Harbor (Outboard Marine), IL	V	10 acres of 37-acre harbor; abandoned boat Slip #3; and a North Ditch which flowed directly into Lake Michigan	PCBs	Hydraulic dredging; Nearshore CDF	38,300	$15	$392
Willow Run Creek, MI	V	Edison and Tyler Ponds - 21 acres combined; Willow Run Sludge Lagoon	PCBs	Dry/wet excavation; nearby new on-site landfill	450,000	$70	$156

Table 1
Summary of Remediated Contaminated Sediment Sites

Project	USEPA Region	Setting	Contaminant Of Concern	Methods of Remediation and Disposal	Volume Removed (cy)	Total Cost (millions)	Total Unit Cost ($/cy)
ROUNDED TOTALS					2.774.430[6]	$522.3[6]	$462[6] (MEAN)

1. Does not include disposal cost. Several years delay to determine disposal method
2. Final volume is a range: midpoint is listed.
3. Cost is a range: midpoint is listed.
4. Cost listed is a midpoint; actual not determined.
5. Listed twice since both dredging and dry excavation were used
6. Does not include sites without either volume or cost data

Table 2
U.S. Sediment Remediation Projects Implemented (>10,000 cy) – Primary Goal versus Outcome

Project	Primary Goal	Basis for Primary Goal	Sediment Remedial Target	Relationship of Target to Goal	Remediation Method	Achievement of Remedial Target	Achievement of Primary Goal
Bayou Bonfouca, LA[1] (169,000 cy)	Reduce PAH human contact risk to $<10^{-4}$ and minimize threat to aquatic biota.	Human health risk assessment	Depth horizon to achieve <1300 ppm PAHs	Direct	Mechanical dredging followed by fill	Depth horizon achieved; no analytical verification	Likely accomplished, particularly since fill was added to the dredged areas. However, post-monitoring consists of the state annual monitoring program for water, sediment, and fish and seems hit or miss. Also, it is unclear if targeted surface PAH levels were achieved since a sediment contact and swimming advisory is still in effect due to PAHs in sediment samples exceeding EPA guideline values, but not verified.
Manistique River, MI[1] (97,050 cy)	Reduce PCB in fish levels, reduce carcinogenic and noncarcinogenic risks to $<10^{-4}$ and <1, respectively, except for high-end subsistence and some high-end recreational exposure from fish consumption.	Human health risk assessment	10 ppm PCBs	Default level after using biota to sediment accumulation factor (BSAF) to estimate a target sediment level, then increasing the estimate to 10 ppm PCBs, which EPA justified based on cleanup levels at other EPA projects, the likelihood of achieving <10 ppm, and future natural burial	Hydraulic dredging	In progress; consistent achievement of 10 ppm or less proving difficult	Too soon to tell. Remediation still in progress in Year 5. No postmonitoring program defined as of yet.
LTV Steel, IN[1] (109,000 cy)	Remove all oil-contaminated sediments from a 3,500-foot man-made intake channel.	Clean Water Act Consent Decree	Depth horizon (removal down to original bottom)	Direct	Hydraulic dredging and diver-assisted removal	Depth horizon achieved; no analytical verification	Likely accomplished, but not verified.
United Heckathorn, CA[1] (108,000 cy)	Achieve EPA marine chronic water quality criteria of 1 part per trillion (ppt) DDT; achieve human health surface water criteria of 0.6 ppt DDT; achieve the National Academy of Sciences action levels for DDT in fish to protect fish-eating birds.	Ecological risk assessment	Remove all "young bay mud" to achieve <0.59 ppm DDT.	Indirect (calculated in the ecological risk assessment)	Mechanical dredging	Depth horizon (penetration into "old bay mud") achieved; 20 samples for chemical analysis collected from top 6 inches of final dredged surface for informational purposes (several exceeded 0.59 ppb DDT)	Too soon to tell; post-monitoring in progress

Table 2
U.S. Sediment Remediation Projects Implemented (>10,000 cy) – Primary Goal versus Outcome

Project	Primary Goal	Basis for Primary Goal	Sediment Remedial Target	Relationship of Target to Goal	Remediation Method	Achievement of Remedial Target	Achievement of Primary Goal
Marathon Battery, NY[1](102,000 cy)	Eliminate adverse ecological impacts by achieving 100 ppm cadmium in sediment in East Foundry Cove (EFC) Marsh and 10 ppm cadmium in other areas; allow natural recovery in over 300 acres of adjacent cove/marsh.	Ecological assessment based on "weight of evidence," bioassay tests, and comparison with ambient water quality standards	Remove top 1 foot of sediment in areas targeting 10 ppm cadmium; remove to <100 ppm cadmium in EFC marsh; allow natural recovery in over 300 acres.	None other than 95% cadmium mass removal predicted	Hydraulic and mechanical dredging; dry excavation	Removed more than top 1 foot; decided to take verification samples for analysis in some areas; achieved an average of 25 ppm cadmium in EFC Marsh; achieved an average of <10 ppm cadmium in EFC and near pier	Post-monitoring in progress. Two years of reported results are inconclusive.
Black River, OH[1](60,000 cy)	Remove all PAH- and metal-contaminated sediments.	Clean Air Act Consent Decree	Depth horizon (removal down to "hard bottom" or "bedrock")	Direct	Hydraulic and mechanical dredging	Depth horizon achieved; no analytical verification	Likely accomplished, but not verified.
Cherry Farm, NY[1] (Niagara River)(42,445 cy)	Reduce PAH-related risks to benthic aquatic life and fish.	Ecological and biotoxicity testing; literature review for ecotoxicity of PAHs	Depth horizons based on characterization data to achieve 20 ppm PAHs in the top 1 foot; 50 ppm PAHs below 1 foot	Vague; target levels set by negotiation and by comparing prevailing PAH levels to upstream background levels	Hydraulic dredging	Achieved depth horizons based on bathymetry; no analytical verification	Unknown; post-monitoring program being negotiated.
N. Hollywood Dump, TN[1](40-acre lake)(40,000 cy)	Restore the pesticide-contaminated fishery in the lake so that it is suitable for human consumption.	Human health risk assessment	Remove or isolate pesticide-contaminated surface sediments.	Direct	Fish harvesting first, then part hydraulic dredging/part direct burial	Achieved	Too soon to tell; long-term bi-annual fish and sediment sampling in progress.
Outboard Marine, IL (Waukegan Harbor)[1](38,300 cy)	Eliminate PCB flux from the harbor into Lake Michigan.	Hydrodynamic modeling	50 ppm PCBs in the harbor; 500 ppm PCBs in Slip #3	Direct for the harbor; unknown for the 500 ppm target in Slip #3	Hydraulic dredging	Unknown. No analytical verification. Dredged to a predefined depth in the harbor to the reportedly uncontaminated sand layer.	Unknown. Some limited analysis of surface samples at undefined locations in the harbor over four years after dredging exhibited 3 to 9 ppm PCBs. PCB levels in harbor fish are trending downward
Ford Outfall, MI (River Raisin)[1](28,500 cy)	Reduce PCB levels in fish.	Risk analysis by EPA	10 ppm PCBs after removal down to the native clay layer	Direct	Mechanical dredging	Partially achieved. Removal to refusal was accomplished. Verification by field test kits, then 14 samples (one per quadrant) for laboratory analysis; seven quadrants had insufficient sediment to collect; four quadrants exhibited 0.5 to 7 ppm PCBs; three quadrants exhibited 12 to 20 ppm PCBs	Unknown. No formal post-monitoring program identified. Results of fish samples and caged fish studies from a monitoring program performed by MI Department of Environmental Quality (MDEQ) are not yet available. Two post removal sediment core samples taken by MDEQ from the dredged area exhibited 60 and 110 ppm PCBs

Table 2
U.S. Sediment Remediation Projects Implemented (>10,000 cy) – Primary Goal versus Outcome

Project	Primary Goal	Basis for Primary Goal	Sediment Remedial Target	Relationship of Target to Goal	Remediation Method	Achievement of Remedial Target	Achievement of Primary Goal
New Bedford Harbor, MA[1](14,000 cy)	Remove PCB mass at an optimum "residual concentration to volume removed" ratio and reduce PCB flux to the water column (interim measure)	Mass removal calculations; flux modeling studies conducted by PRPs; water column data	4,000 ppm PCBs in five acres of hot spots	Direct	Hydraulic dredging	Achieved based on a limited number of verification samples (15 composite samples ranging from 67 to 2,068 ppm PCBs)	Achieved mass removal. Water column data post-dredging (if collected) not obtained. PCBs in surface sediment samples in the Upper Harbor increased 32% on average, following hot spot dredging
GM (Massena), NY[1](13,800 cy)	Reduce PCB levels in fish.	Human health risk assessment	Achieve 1 ppm PCBs and remove as much sediment as technically feasible.	Vague; 0.1 ppm PCBs desired, but 1 ppm selected based on technical feasibility	Hydraulic dredging	Not achieved. Average residual PCB levels at completion in six dredged quadrants across 11 acres ranged from 3 to 27 ppm with a maximum of 90 ppm	Two annual post-dredging fish monitoring programs completed. No discernible trends other than a slight increase in fish PCB concentration in Year 2 versus Year 1
Gould (Portland), OR[1](11,000 cy)	Vague; apparently protect from direct contact risk and remove lead-contaminated surface (0 to 2 feet) sediments that exceed the extraction procedure (EP) toxicity concentration.	Applicable or relevant and appropriate requirement (ARAR)	5 ppm lead	Not identified	Hydraulic dredging followed by filling in the 3.1 acre lake	Achieved based on verification sampling	Apparently achieved
Newburgh Lake, MI[2](588,000 cy)	Restore 105-acre lake depth and restore fishery.	Not identified.	Depth horizon which will both restore depth and remove the detectable PCBs	Direct	Dry excavation supplemented by hydraulic dredging in undrained bypass channel through the lake	Depth horizon achieved; no analytical verification	Achieved, but no analytical verification. Fish harvested and restocked. Post-monitoring not identified.
Willow Run Creek, MI[2](450,000 cy)	Eliminate adverse ecological impacts.	Ecological assessment based on ecological ingestion modeling, then feasibility and compliance with MI Environmental Response Act 307	Removal to 21 ppm or 1 ppm PCBs below waterline depending on locale; removal to 21 ppm or 2 3 ppm PCBs above waterline	Direct	Dry excavation	Achieved based on verification sampling	Unknown. No formal post-monitoring is planned.
Lipari Landfill, NJ[2](163,500 cy)	Reduce human health risk from direct contact with or air exposure to targeted VOCs to below 10^{-6}.	Human health risk assessment	Depth horizon 6 inches into the underlying Kirkwood Clay layer to achieve nondetect for bis(2-chloro-ethyl)ether	Direct	Dry excavation	Depth horizon achieved except in areas where no Kirkwood Clay was encountered, in which instances excavated 18 inches below a level extrapolated from adjacent contiguous clay layers; no analytical verification	Apparently achieved, particularly since clean fill was also placed. No post-monitoring identified.

Table 2
U.S. Sediment Remediation Projects Implemented (>10,000 cy) – Primary Goal versus Outcome

Project	Primary Goal	Basis for Primary Goal	Sediment Remedial Target	Relationship of Target to Goal	Remediation Method	Achievement of Remedial Target	Achievement of Primary Goal
Bryant Mill Pond, MI (Kalamazoo River) [2](165,000 cy)	Mitigate the public health threat posed by direct human and wildlife contact and mitigate threats posed to aquatic life and wildlife by ongoing releases (i.e., source control) to the Kalamazoo River.	Ecological risk assessment along with direct observation of continuing releases by erosion and sloughing from banks	10 ppm PCBs	Unknown	Dry excavation	Reportedly achieved based on verification sampling. Sample results not obtained or reviewed.	Unknown and probably too early to tell since removal was completed in June 1999. However, as stated in the Action Memorandum, "the nature of the removal is, however, expected to minimize the need for post-removal site control, at least in the Bryant Mill Pond area."
Loring AFB, ME[2](162,000 cy)	Reduce human health risk to below 10^{-6} and below a hazard index of 1 and eliminate adverse ecological impacts.	Human health and ecological risk assessments	Various for specific contaminants (e.g., 1 ppm Aroclor 1260, 35 ppm total PAHs)	Direct	Dry excavation	Apparently achieved based on verification sampling for PCBs and less rigorous testing for five other indicator compounds	Too soon to tell. A long-term environmental and wetlands monitoring plan was finalized in late 1998.
Love Canal, NY[2](31,000 cy)	Reduce human health risk from direct contact and from fish consumption.	Evaluation of various health advisories for dioxin from multiple sources such as NY Department of Health, Canadian agencies, and FDA	1 ppb 2,3,7,8-TCDD (CDC action level)	Direct	Dry excavation	No details obtained	Probably achieved, but no details obtained.
Hooker (102[nd] Street), NY[2](28,500 cy)	Vague; apparently reduce risk from fish ingestion to below 10^{-4} to 10^{-6} and a hazard index of 1 and reduce water concentrations to below state water quality standards.	Human health risk assessment and environmental endangerment assessment	Remove out to a "clean" boundary line and to a depth horizon dictated by characterization data	Vague	Dry excavation	Areal and depth horizon achieved; no analytical verification	Too soon to tell. One foot of fill added to remediated areas. No post-monitoring identified.
Tennessee Products, TN[2](24,100 cy)	Remove visual coal tar material from several thousand feet of the creek (interim measure).	Non-time critical removal action	Remove all visual coal tar material	Direct	Dry excavation	Achieved. Visual confirmation only.	Achieved. Visual confirmation only.
Town Branch Creek, KY[2](17,000 cy)	Reduce PCB in fish levels to <2 ppm FDA limit.	State environmental agency evaluation and Circuit Court Judgment	0.1 ppm PCBs	Direct	Dry excavation	Achieved sediment removal to extent practical but not always 0.1 ppm in 30% of 3.5 miles of creek so far. Work on remaining 2.5 miles on hold pending resolution of access issues.	Too soon to tell. Post-monitoring planned after all of remediation is completed
Triana/Tennessee River, AL[2](no removal)	Reduce DDT in fish levels to <5 ppm FDA limit.	Negotiated agreement and Consent Decree to restore the fishery	Rechannelization and direct burial of the two isolated tributaries (2.5 miles) containing an estimated 93% of the DDT mass	Vague, basically a "try it and see what happens" approach	Stream diversion, direct burial, and some natural recovery	Achieved	Substantial progress. One target species reached the 5 ppm standard in the 10-year attainment period, two species did not but they exhibit 80 to 90% DDT reductions in the 10 years. Annual monitoring continuing

Table 2
U.S. Sediment Remediation Projects Implemented (>10,000 cy) – Primary Goal versus Outcome

Project	Primary Goal	Basis for Primary Goal	Sediment Remedial Target	Relationship of Target to Goal	Remediation Method	Achievement of Remedial Target	Achievement of Primary Goal
James River, VA[3] (no removal)	Allow natural recovery of fish and biota to below FDA limit for Kepone (0.3 ppm in fish and 0.4 ppm in blue crabs).	Technical impracticability of achieving FDA limits in fish by remediation	None	N/A	Natural recovery	N/A	Natural burial by clean sediments is continuing to decrease the bioavailability of Kepone. Crab/oyster Kepone levels dropped from 0.8 to 0.1-0.2 ppm from 1976 through 1985. The commercial fishing ban was lifted in 1988; only a subsistence fish eating advisory remains.
Sangamo-Weston, SC[3] (no removal)	Reduce PCB in fish levels to <2 ppm FDA limit by natural recovery.	Technical impracticability of achieving risk-based concentrations in fish by remediation; existence of an ARAR (the FDA limit); and the voluntary nature of fish consumption	1 ppm PCBs	Default level, per the Record of Decision: "The time for two to eight year old largemouth bass to achieve 2 ppm for the range of sediment cleanup goals was compared to a baseline. It was determined that fish PCB levels decline at about the same rate regardless of sediment cleanup goal. Therefore, 1 ppm was selected based on technical feasibility…"	Natural recovery; modeling predicts 2 ppm levels in fish will be reached by 2004	Too soon to tell	Too soon to tell. Annual monitoring in progress. No reports yet available for review.

Notes:

1. True dredging projects
2. Dry excavation projects
3. Natural recovery projects

TABLE 3

COST FACTORS ASSOCIATED WITH SEDIMENT REMOVAL

A. Extent of Sediment Subject to Removal

- Larger Extent = Larger Costs
- Economies of Scale Advantages Significantly Diminish with Larger Projects

B. Dredge production rate which is primarily dependent upon:

- unique site conditions such as access, water depth, debris/vegetation, and free oil
- the targeted sediment depth or cleanup level
- limitations in land-based water management facilities
- operational controls imposed to limit resuspension
- whether or not verification sampling is performed during dredging

C. Disposal cost which is dependent upon type of contaminant, and type and location of disposal facility. Commercial disposal facilities tend to be more costly, but may be appropriate for smaller projects or may be required under regulation (e.g., RCRA, TSCA)

- The disposal methods for 50 completed removal projects were: offsite landfill or pond (26); onsite landfill, pond/CDF, or burial (15); offsite thermal treatment (2); onsite thermal treatment (3); other, such as stabilization and beneficial reuse (4); disposal method not selected or unknown (2). (Note: Two of the projects used a combination of 2 disposal methods)

D. Access: Availability of upland areas for staging, sediment processing, and disposal (if on-site) can significantly affect cost and the absence of such areas in fact makes a project infeasible. Limited access can result in higher costs due to:

- More extensive river-based transport of sediment
- Costs to obtain access from property owners
- More extensive land-based transport of sediment

E. Presence of Rocks, Vegetation, and Debris: The presence of obstructions not only impacts dredge selection, but may require multiple equipment types to be used, which will increase costs.

TABLE 4

PERFORMANCE FACTORS ASSOCIATED WITH SEDIMENT REMOVAL

A. Performance Metrics – Primary Risk-Based Measurements of the Effectiveness of Removal

- Bioavailable Surface Sediment Characteristics Before and After Removal
  - Chemical Contamination Levels
  - Organic Carbon Levels
  - Physical Characteristics (Affecting Mobility)
  - Density
  - Geotechnical (Cohesion, etc.)
  - Bathymetry (verify amount removed and geometry)

- Biota Concentrations Before and After Removal
  - Resident Fish
  - Other Site-Specific Species
  - Caged Fish (Controlled Study Bioavailability Indicator)
    - Can Also Be used During Removal

- Water Column Data Before, During, and After Removal
  - Chemical Contamination Levels
  - Total Suspended Solids (TSS)
  - Turbidity (sometimes an indicator of TSS)

- Ambient Air Concentrations Before, During, and After Removal
  - Need for measurement is Chemical and Site-Specific

B. Factors Affecting Performance of Sediment Removal

- Aquatic Environment Characteristics
  - Water Body Type (Lake, River, Harbor, Estuary, Bay)
  - Water Level Fluctuations (Tides, Seiche, etc.) – Can affect accessibility to sediment
  - Water Velocities – Will affect selection and performance of dredge equipment and resuspension controls
  - Water Depth – Will affect accessibility and equipment selection

- Sediment Characteristics
  - Presence of Debris (rock, timber, man-made objects) – will require removal or will limit effectiveness of removal; even with removal may create cavities which may limit removal of remaining sediment
  - Sediment Depth – Deeper sediment removal drives multiple dredge passes, more likely to leave furrows/windrows and higher removal volumes to account for side sloughing
  - Subbottom Characteristics (Below Contamination) – Bedrock, hard pan, and irregularity all act to reduce effectiveness of removal by inherently leaving material behind
  - Sediment Type (Sand, Gravel, Silt, Clay) – Fines will tend to be resuspended and either migrate, desorb contamination, and/or settle (in the removal area or elsewhere in system); also clays tend to clog hydraulic dredges
  - Type of Contamination – Highly sorptive chemicals will tend to stay with solids; less sorptive compounds more likely to be released to water column
  - Chemical Concentration Profile – Higher contamination at depth will have a tendency to result in higher concentrations remaining after removal

- Removal Equipment Selected – dredging (or removal through water column) inherently limits capability to accurately remove sediment since operator can't see sediment to be removed
  - Hydraulic dredges – (Numerous Types Available)
    - Resuspension inevitable, although generally less than mechanical removal

- Material left behind due to "furrowing", irregular subbottom, settling, or resuspended material
- Releases with transport pipeline malfunctions/breaks
- Mechanical Dredges (Primarily Clamshells)
  - Resuspension inevitable; recent innovations (Cable Arm, Bonacavor) claim to reduce, but can't eliminate
  - Material left behind due to "cratering", sloughing, irregular subbottom, settling of resuspended material
- Excavation in "Dry" Conditions
  - Air emissions (dust, chemical) may need to be controlled
  - Material left behind due to irregular subbottom, "smearing", equipment tracking, wet slurry conditions from infiltration

- Resuspension Control System – Suspended silt curtains, sheetpiling typically used to minimize migration of inevitable sediment resuspension. None are watertight, so releases are inevitable. The higher degree of containment will act to allow reuspended sediment to settle within removal area, less containment will allow material to settle outside removal area.

- Disposal Method
  - Onsite (landfill, confined disposal facility) vs. offsite commercial facilities
  - The method of disposal will affect the dredge technology selection, and limit sediment removal rates (due to dewatering and water treatment requirements)

- Predisposal Processing – This factor is primarily defined by the disposal method and may include
  - Primary settling
  - Dewatering
  - Stabilization/Solidification
  - Water Treatment
  - The extent of pre-processing required will drive the need for space, affect dredge selection, affect production rates (may increase project duration), and increase risk of contaminant release (more unit processes)

C. **Uncertainties Associated with Sediment Removal**

- Unpredictability of Sediment Concentration After Removal
- Bioavailable Surface Sediment Concentration Affects Biota Levels and Water Column concentrations
- Highly Variable Results Achieved Elsewhere (see Table 1 and 2)
- Numerous Variables Involved (see Table 3) which Essentially Prohibit Prediction of Results at a Given Site
- This Uncertainty Must be Recognized Before Embarking on Sediment Removal Project
- Site Conditions Never Entirely Predictable
- Underwater Environment Compounds This Common Uncertainty at All Contaminated Sites
- Surprises Are Inevitable
  - Volumes Tend To Increase
  - Debris Tends to Be More Extensive
- Project Schedule and Cost (refer to Cost Factors in Table 3)
- Weather Unpredictability Can Affect Schedule and Cost
- Extent of Winter Weather Affects Overall Schedule
  - Freeze-up Significantly Reduces or Prohibits Removal Productivity and Interferes with Land-Based Water Handling and Treatment
- Items A and B above Also Impact Schedule and Cost

Appendices

Appendix A

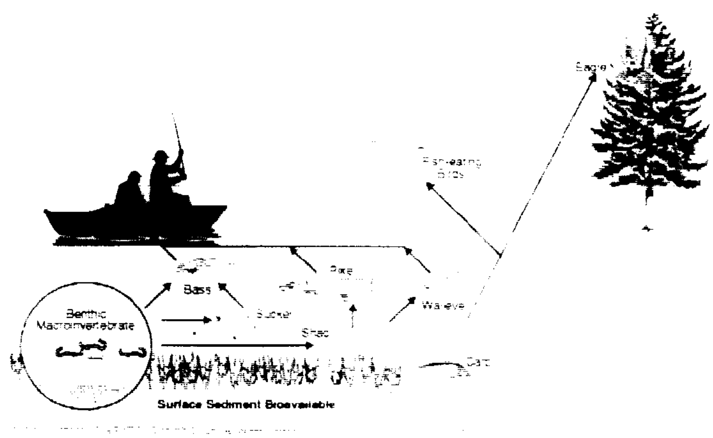
Surface Sediments Play Key Role in Driving Risk

APPENDIX A - Surface Sediments Play Key Role in Driving Risk

Contaminants accumulate in sediments if they possess chemical properties that cause them to associate preferentially with the particulate matter that forms the sediment. These same properties tend to cause such contaminants to accumulate in biotic tissue and to become more concentrated as they are transferred through the food web. As a result, ingestion of fish is typically the prevailing human and ecological exposure pathway at contaminated sediment sites.[1]

The transfer of a contaminant from sediment to fish is initiated by direct transfer from sediments to benthic animals or by the flux of contaminant from the sediment to the water column and the transfer from water to animals living in the water column. Either way, the sediments involved in the transfer are those close to the sediment-water interface. Sediments buried below the surface "mixed" layer subject to disturbance by hydrodynamic forces or inhabited by benthic animals typically provide almost no contribution to the transfer process. This is so because the contaminant's propensity to associate with the sediment particulate matter greatly inhibits its ability to migrate from below the mixed layer into the mixed layer.

At most sites, the primary route of exposure for people or wildlife is consumption of fish that have accumulated contaminants from the surface of the sediment bed. Contaminants located at the sediment surface, as shown in the adjacent diagram, are "bioavailable" and thus prone to transfer up the food chain from benthic organisms to fish and on to higher-level receptors such as fish-eating birds and mammals.



The size of the surface mixed layer depends on the nature of the sediment particles, the magnitude of the forces placed on the sediments by currents and waves and the depth to which infaunal benthic animals mix sediments in a process termed "bioturbation." In most cases, bioturbation is the controlling factor. Studies have shown that depths can range up to about 20 centimeters, but are typically on the order of 10 centimeters or less in sandy substrate (Palermo et al., 1998). Below this hydrologically and biologically active surface layer, contaminants may be locked in the consolidated deeper sediments and, according to the IJC (1997), "once buried in deep sediment, particles are often considered lost to the system" and thus unavailable for transport or exposure. In these cases, newer sediments with continually lower concentrations deposit on the surface and gradually bury those older sediments having higher concentrations representative of past discharges. These long-buried contaminated sediments remain unavailable

[1] Major transport mechanisms include downstream migration of contaminated fine-grained materials that are suspended within the overlying water column (carried as a portion of bed load); partitioning to dissolved organic matter; or available as dissolved-phase in the water column (Paris, et al. 1978; Valsaraj et al., 1997).

for biological exposure and therefore pose no appreciable associated risks. In the words of a guidance document from EPA's Assessment and Remediation of Contaminated Sediments (ARCS) Program (EPA, 1998):

> Humans, aquatic organisms and wildlife will generally only be exposed to sediment contaminants in the uppermost active layer of the sediment deposits. Hence, contaminated sediments separated from the overlying water by a surface layer of relatively clean sediments may not represent an ongoing risk to humans aquatic organisms or wildlife. [I]n fact, as ARCS and other coring studies have shown, the most contaminated sediments may be located well below the surface sediment (i.e., in older sediments)."

These factors combine to suggest that in order for dredging (or any other remedy) to be effective in reducing exposure and associated risks, it must "break the link" between the surface sediment source of contaminants and the fish and other receptors within the system's food webs. If remediation can effectively reduce surface sediment concentrations, bioavailability will be reduced and subsequent exposure to all receptors along the food chain from benthic organisms to fish and on to humans and wildlife also will be reduced. Remedial actions that do not address these linkages will not be effective in reducing bioavailability, exposure, and potential risks (IJC, 1997). Thus, any action that fails to create a sufficiently clean sediment surface will not be effective in achieving the desired risk reduction.

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Appendix B

Environmental Dredging – Site Profiles

APPENDIX B – Environmental Dredging – Site Profiles

This appendix summarizes several case-study examples of dredging.

Among the many sites referenced or mentioned in this paper, the following sites are reviewed in greater detail within this appendix:

- Grasse River, NY
- St. Lawrence River, NY
- Sheboygan River, WI
- Lake Järnsjön, Sweden
- Fox River, WI (2 projects)
- Duwamish Waterway, WA
- River Raisin, MI
- Manistique River/Harbor, MI
- Shiawassee River, MI
- Ruck Pond, WI
- Waukegan Harbor, IL
- New Bedford Harbor, MA

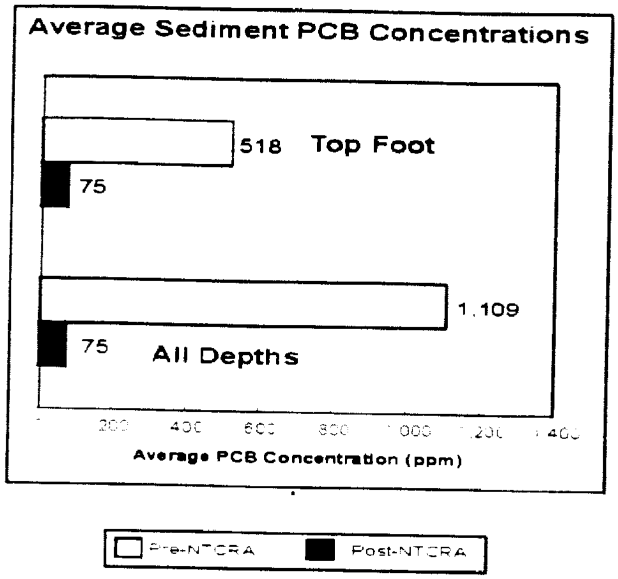
Compared to navigational dredging, environmental dredging is in its infancy. Through 1999, only about 50 sediment removal projects have been completed, compared with the many hundreds of navigational dredging projects completed over many decades. These 50 projects largely exclude small projects [i.e., less than 3,000 cubic yards (cy)], since these smaller projects typically represent spill cleanups, interim measures, or "hot-spot" removal actions that are much less representative of larger-scale dredging. Monitoring data at these 50 sites is typically lacking and sporadic. Indeed, the International Joint Commission (IJC) (1999) notes that for 38 remediation projects in the Great Lakes region, "only two currently have adequate data and information on ecological effectiveness." Further, the IJC suggests that "much greater emphasis be placed on post-project monitoring of effectiveness of sediment remediation," that "a high priority be placed on monitoring ecological benefits and beneficial use restoration," and that "additional research is essential to ... forecast ecological benefits and monitor ecological recovery and beneficial use restoration in a scientifically defensible and cost effective fashion" (IJC, 1999). Of the 50 completed projects, 25 are polychlorinated biphenyl (PCB) sites (see Table 1), and of these 25, 13 have some data that are useable for asssessing how effective dredging has been. Each of these sites are discussed below.

As described in Appendix A, the level of PCBs accumulated by fish depends on the concentration of PCBs found in surface sediment and the water column. Although PCB concentrations in fish may be the most important source of potential risks to humans and wildlife, it can take years for PCB concentrations in fish to respond to a dredging project. In addition, there are limited fish data available for completed environmental dredging projects. Thus, PCB concentration in residual surface sediment provides a more immediate and the most important measurement of the effectiveness of dredging in reducing human and ecological risks. This appendix discusses the available data for residual PCB concentrations in surface sediment, the water column, and fish tissue for several environmental dredging projects. A more thorough evaluation of fish data at many of these sites is provided in the paper titled "Effectiveness of Sediment Removal: An Evaluation of EPA Region 5 Claims Regarding Twelve Contaminated Sediment Removal Projects" (FRG, 1999), which is included as Appendix C. Additional information on these sites and other sediment removal projects can be found in the Major Contaminated Sediment Sites (MCSS) database.

Grasse River – Massena, New York

Between July and September 1995, Alcoa, Inc. removed approximately 3,000 cy of sediment and boulders/debris from two areas of the Grasse River due to elevated levels of PCBs (up to 11,000 mg/kg). The removal areas covered approximately 1 acre of the Grasse River (i.e., a river area and adjacent outfall structure). The goal of the removal action was to remove all sediment within these areas to the extent practicable. Nearly 400 cy of boulders were removed from a "boulder zone" with a mechanical long-stick excavator (with a specialized perforated bucket) mounted on a barge. The sediments were removed using a horizontal auger hydraulic dredge. Sediments were dewatered and disposed with the boulders and debris in an on-site landfill (BBL, 1995b). Sediments within the outfall structure were removed using small manually directed plain-suction hydraulic hoses.

Sediment Data:



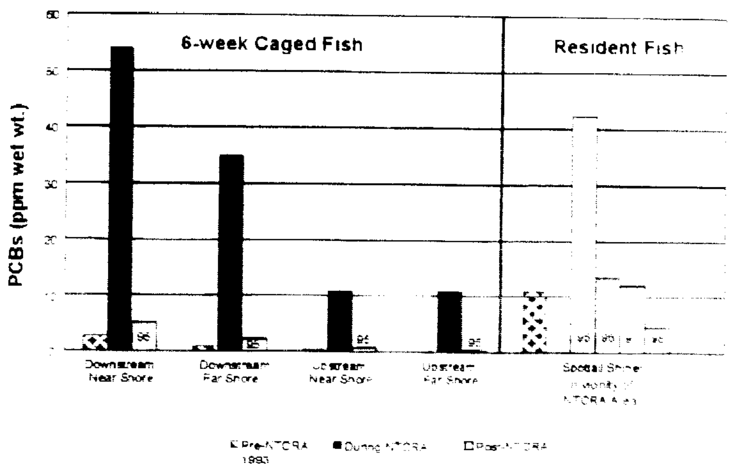
As shown on the figure at left, pre-removal PCB surficial sediment concentrations (i.e., top 12 inches in this case) ranged from 12 to 1,780 parts per million (ppm) (average of 518 ppm). After hydraulic dredging was completed in an effort to remove all sediment, an average sediment depth of 4 inches (up to a maximum of 14 inches) remained even after multiple dredge passes. Based on these results, U.S. Environmental Protection Agency (EPA) and its representatives, Alcoa, and the contractors determined that sediment had been removed to the extent practicable (BBL, 1995c). Conditions such as the rocky nature of the river bottom and the presence of hardpan reduced the dredge's effectiveness in removing sediment. It was estimated that approximately 84% of the sediments were removed (along with 27% of the PCB mass in the lower Grasse River). Following removal, residual (surficial) PCB concentrations ranged from 1.1 to 260 ppm (average of 75 ppm). Moreover, at 30% of post-removal sample locations, residual surface sediment PCB concentrations increased relative to pre-removal concentrations (BBL, 1995c). Even in the outfall structure, where operators were able to manually direct vacuum hoses to remove sediment, surface sediment remained with PCB concentrations of 108 ppm (388 ppm PCBs in surface sediment before removal).

Water Data:

During removal activities, a triple-tiered silt curtain system was used in an attempt to contain suspended PCB-containing sediments. The curtains were quite effective in containing suspended sediments, with only one action level exceeded for total suspended solids (TSS) and turbidity. However, elevated PCB water column concentrations were observed: that is, PCBs were present in 88% of the samples collected at a location 2,300 feet downstream of the removal area, while PCB were detected only once at the upstream location. Also, two of the downstream fixed-station filtered samples had quantifiable PCB levels, whereas quantifiable levels were never observed at this location in the pre-removal monitoring.

Fish Data:

In addition to water column PCB level increases during removal, increases in fish levels also were noted during removal. The figure to the right shows both caged fish and spottail shiner data before, during, and after removal. Although limited data are available before removal, it is obvious that sediment removal increased PCB levels in fish during removal, and levels remained elevated for several years following removal.



Other resident fish (i.e., brown bullhead and smallmouth bass) also were collected and analyzed for PCBs as part of pre- and post-removal monitoring (through 1998) of the Grasse River project. Review of the post-removal monitoring results reveal that there was generally no reduction in potential long-term risks to human health and the environment as a result of these dredging activities. For example, resident fish collected in 1995 immediately following removal exhibited an increase in PCB concentrations. PCB concentrations in resident smallmouth bass and brown bullhead samples collected prior to the removal activities are similar to those collected in 1997 and increased slightly in 1998. Overall, the apparent negative effect of the removal was greater for smallmouth bass than for brown bullhead and was most significant for spottail shiners, with the most significant differences observed in the vicinity of the removal area.

St. Lawrence River - Massena, New York

Between May 8 and December 22, 1995, General Motors (GM) removed approximately 13,250 cy of PCB sediment and associated boulders/cobbles from an approximate 11-acre area of the St. Lawrence River. These materials were dewatered and stockpiled at the GM Powertrain facility for subsequent off-site disposal.

EPA selected a 1 ppm sediment cleanup goal in the St. Lawrence River because it believed it was achievable and provided an acceptable measure of human health protection. In doing so, EPA, believed it had balanced its desire for a very low cleanup level to minimize residual risk with the constraints posed by the limitations of dredging as a means of removing sediment (in Turtle Creek, an applicable or relevant and appropriate (ARAR) cleanup level of 0.1 ppm was set). However, EPA recognized that technical limitations may preclude removal of sediments to this level (EPA, 1990b).

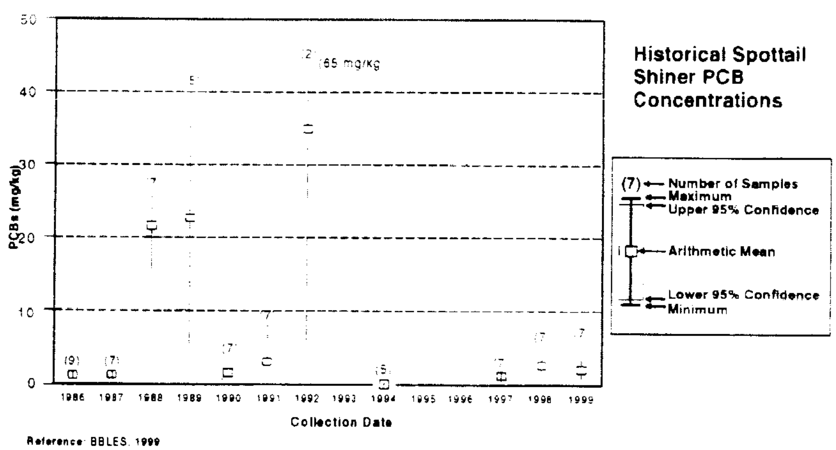
After efforts to utilize a silt curtain containment system failed (due to excessive water velocities), a sheetpile wall was installed around the removal area as a suspension containment measure. Prior to sediment removal, the initial footprint of the sheetpile wall was modified to exclude a cobble and boulder zone. It was agreed by the EPA and GM that the removal of sediment from this area was technically impractical because of large boulders and the potential for slope failures. Within the removal area, boulders and debris were removed mechanically prior to hydraulic dredging.

Sediment Data:
Pre-removal surficial sediment PCB concentrations ranged from non-detect to 4,430 ppm (average of 200 ppm) (ERM, 1993).

Even after significant passes with a hydraulic dredge were performed (up to 15 to 30 passes in some areas), residual surface sediment in all six removal quadrants remained above the cleanup goal of 1 ppm, with an overall average PCB-concentrations of 9.2 ppm (average PCB concentrations were up to 27 ppm in one quadrant). EPA determined that sediments were removed to the maximum extent possible. Consequently, EPA "determined that installation of a cap over Quadrant 3, effectively isolating this area from the rest of the river, was the only remaining technically practicable remedial alternative." This area was subsequently capped with a multi-layer granular cover (BBLES, 1996a).

Water Data:
Early on in the sediment removal process, turbidity action levels were exceeded due to turbid water escaping over the top of low sheetpiling sheets. The low sheets were installed according to the design and assured stability of the containment system during storms and high waves from passing ships. To compensate for the low sheets, the contractor installed filter fabric over the low sheets and installed short steel sheets over some of the low sheetpiles. At one point during sediment removal activities, elevated water column turbidity and PCB levels were reported outside of the sheetpile wall. Due to the high concentrations, a silt curtain was installed along the inside of the sheetpile wall. PCBs were also released via air as PCBs were detected at levels exceeding the project action level at the closest downwind sample location.

Fish Data:
The figure below shows total PCB concentrations in spottail shiner (the only species monitored) whole-body composite samples collected from the GM site. PCB levels may have decreased since the late 1980s, but comparison of the pre- and post-remediation data are complicated by factors such as fish sizes, lipid contents, species, mobility, and uncertainties about sampling locations (especially the 1988-89 and 1992 data relative to all other years). Previous sampling locations are important for data comparability over time. Note that remediation occurred in 1995.



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The annual monitoring reports describe an anomaly to the apparent general downward trend since the late 1980s: two spottail shiner samples collected by New York State Department of Environmental Protection (NYSDEC) in 1992. The wide difference in concentrations for these two samples (total PCB concentrations of 5.7 mg/kg and 65 mg/kg) is difficult to explain. Similar variability, although not as great, is also evident in the data collected by the Ontario Ministry of the Environment (OME) in 1989. The variability of the data may be due to several factors, including differences in sampling locations, fish lengths and sizes, fish lipid content, or species mobility. In fact, discussions with both NYSDEC and OME regarding sampling locations indicate that the specific sampling locations cannot be determined. This is extremely important given the relative size of the St. Lawrence River [about 2,000 feet wide 250,000 cubic feet per second (cfs)] compared to the area dredged (about 200 feet wide in an embayment). Post-dredging sampling locations are well documented, but without pre-dredging location details, one cannot consider the data truly comparable. Regardless, the variability of the data precludes a more detailed evaluation and interpretation of the overall spottail shiner data. As such, the monitoring reports conclude that the significance of the 1997, 1998 and 1999 PCB data, and any apparent trends, will need to be more thoroughly evaluated following the collection of additional data over the next several years.

Sheboygan River – Sheboygan Falls, Wisconsin

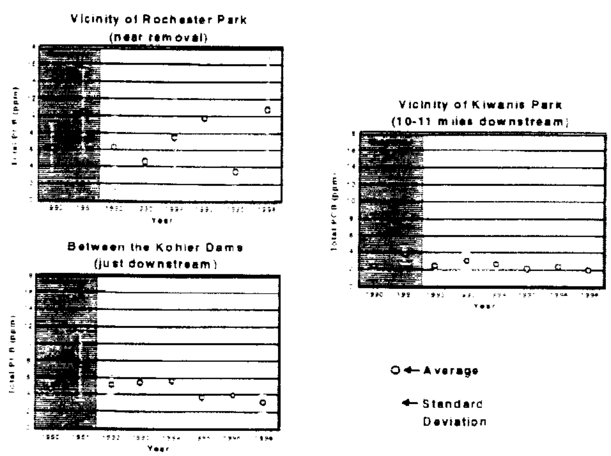
Approximately 3,800 in-situ cy of PCB-containing sediments were removed from the Sheboygan River by Tecumseh Products Company (Tecumseh), the only participating potentially responsible party (PRP), from 17 discrete sediment deposits in the Upper River from 1989 through 1991 using a modified "sealed" clamshell mechanical dredge. Dredging was performed within the confines of a silt containment system comprised of an internal geotextile silt screen and external geomembrane silt curtain. In general, a minimum of two dredge passes (and up to four passes in some areas) were performed in each area followed by sampling and analysis. The first dredge pass was performed in an effort to remove as much sediment as possible (i.e., to hard subgrade material). Following the first pass, the resuspended sediment within the silt containment system was allowed to settle, and a second dredge pass subsequently followed. Additional dredge passes were utilized if post-dredging sampling results exhibited elevated PCB levels (BBLES, 1992; BBL, 1995a, 1998).

Sediment Data:
Pre-removal surficial sediment concentrations ranged from 0.2 to 4,500 ppm (average 640 ppm) in 1987. Post-removal surficial sediment concentrations ranged from 0.45 to 295 ppm (average 39 ppm). Following four dredge passes, one sediment deposit exhibited residual PCB concentrations up to 295 ppm. The EPA and Wisconsin Department of Natural Resources (WDNR) agreed that the sediment had been removed to the extent practicable and directed Tecumseh to cap and armor the deposit to contain the sediment and residual PCBs (BBL, 1995a). At another Upper River deposit, pre-removal surficial sediment PCB concentrations ranged from 2.6 to 8.2 ppm (average of 5 ppm) with 1.6 to 1,400 ppm (average of 376 ppm) present in subsurface sediment. Following several removal passes, up to 136 ppm remained in a portion of this deposit. Again, the EPA and WDNR directed that that portion of the deposit be capped/armored. Two other deposits also required capping and armoring to contain elevated residual PCB concentrations following dredging. Removed sediments remain in on-site facilities pending final disposal.

Water Data:
Water-column monitoring activities were conducted before, during, and after sediment removal activities by measuring total suspended solids (TSS) and/or turbidity and PCBs. Monitoring data indicated an increase in PCB concentrations in the water column during dredging. As a result, dredging was halted several times during the project due to increased turbidity, PCB water-column concentrations, or visual observations of sediment migration. Specifically, PCBs were detected in one or more fixed downstream sampling stations during 19 of 29 sampling events, with the highest measured concentration of 0.47 ppb detected at a location approximately 500 feet downstream of removal activities. No PCBs were detected at the upstream location during that sampling round. Typical causes of elevated PCB or turbidity levels included water disturbances from boats, breaking ice, barges in motion upstream of the sample locations, damaged silt curtains due to high flows, etc. In addition, PCB concentrations within the silt control system were as high as 8.3 ppb (measured 11 days after dredging activities were completed) (BBL, 1995a).

Fish Data:
The figure at left shows the smallmouth bass data collected during and after removal activities. Note that no pre-removal data are available due to a laboratory problem. There is no apparent downward trend, and therefore no apparent risk reduction, in the Rochester Park vicinity (area where removal activities were concentrated), despite removal of over 95% of the PCB mass from the targeted deposits and 70% overall mass removal from the Upper River. In addition, although a slight downward trend is evident between the Kohler Dams and in the vicinity of Kiwanis Park, after sediment removal, both locations show an increase in 1991, possibly a result of removal activities.

Sheboygan River - Smallmouth Bass Mean Total PCB Concentrations (1990 - 1996, 1998)

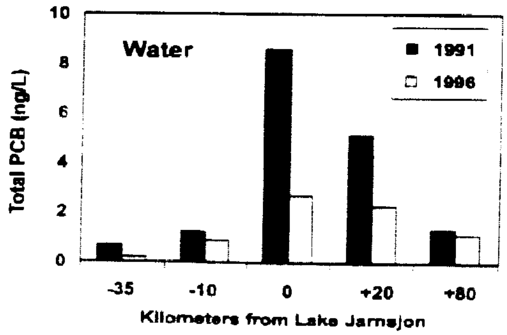


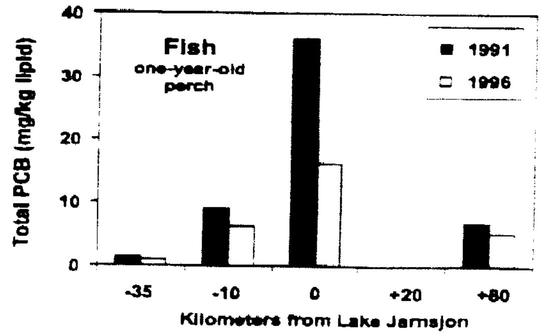
Lake Järnsjön - Sweden

Lake Järnsjön is a 62-acre lake located 72 miles upstream of the mouth of the Emån River in Sweden. In 1993/1994, approximately 196,000 cy of PCB sediments were removed from the lake.

Sediment Data:
Pre-removal PCB concentrations in sediment in 1990 and 1992 ranged from 0.4 to 30.7 ppm (average 8.1 ppm) in the top 1.3 feet and 0.18 to 2.9 ppm (average 1.5 ppm) in the top 0.1 foot (Bremle, Okla, and Larsson, 1998). Sediment remained following dredging with post-removal concentrations ranging from 0.01 to 0.85 ppm (average 0.13 ppm) from the top 0.66 feet (Bremle, Okla and Larsson, 1998).

Water and Fish Data:
Although this project appears to have been successful in reducing surficial sediment PCB concentrations, review of the fish data indicate that PCBs in the lake continue to influence fish concentrations.





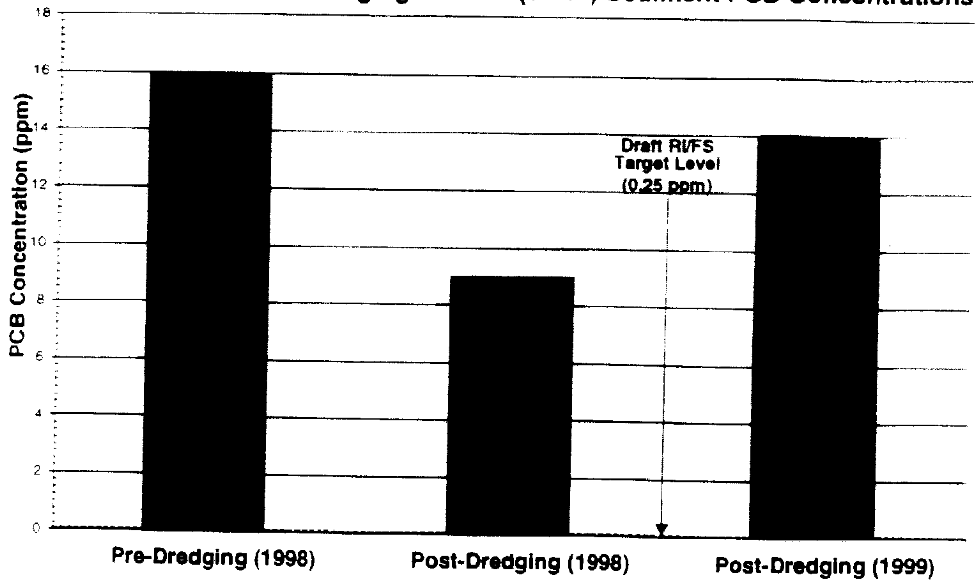
The two graphs shown above depict total lipid-normalized PCB concentrations in fish (one-year-old perch) and water from the Emån River, comparing 1991 pre-remediation levels with 1996 post-remediation levels. Spatial trends are also apparent and indicate that while PCB concentrations decreased by approximately 50% in Lake Järnsjön, upstream and downstream concentrations were also on the decline likely due to ongoing system-wide natural recovery processes. Finally, it is apparent that even after dredging an estimated 97% of PCB mass from the entire bottom of Lake Järnsjön, lake sediments remain a dominant source of PCBs to fish and the water column (FRG, 1999).

Fox River Deposit N – Kimberly, Wisconsin

Sediment Data:
Approximately 8,200 cy of sediment was removed from a 3-acre area at Deposit N [Note: This volume includes 1,000 cy of sediment from a nearby sediment area (Deposit O)] in the Fox River located near Little Chute and Kimberly, Wisconsin beginning in November 1998 as part of a demonstration project. The project specification for the demonstration project was to remove the majority of the contaminated sediments from the 3-acre area deposit efficiently and in a cost-effective manner, realizing that a thin layer of sediment would be left behind due to the presence of bedrock and the limitations of dredging (Foth & VanDyke, 2000). The sediment volume targeted for removal was approximately 65% of the 11,000 cy present in Deposit N (Foth & VanDyke, 2000). Two rounds of dredging were conducted at Deposit N, the first during November and December 1998 and the second between August and October 1999, since dredging could not be completed in 1998. Subsequent to the removal of approximately 7,200 cy of sediment from Deposit N, funds and good weather allowed the removal of approximately 1,000 cy from Deposit O in October and November 1999. The overall cost of the demonstration project was $4.3 million, which equates to unit cost of $525 per cy (Foth & VanDyke, 2000).

Fox River Deposit N - West Lobe

Average Pre- and Post-Dredging Surface (0-<6") Sediment PCB Concentrations



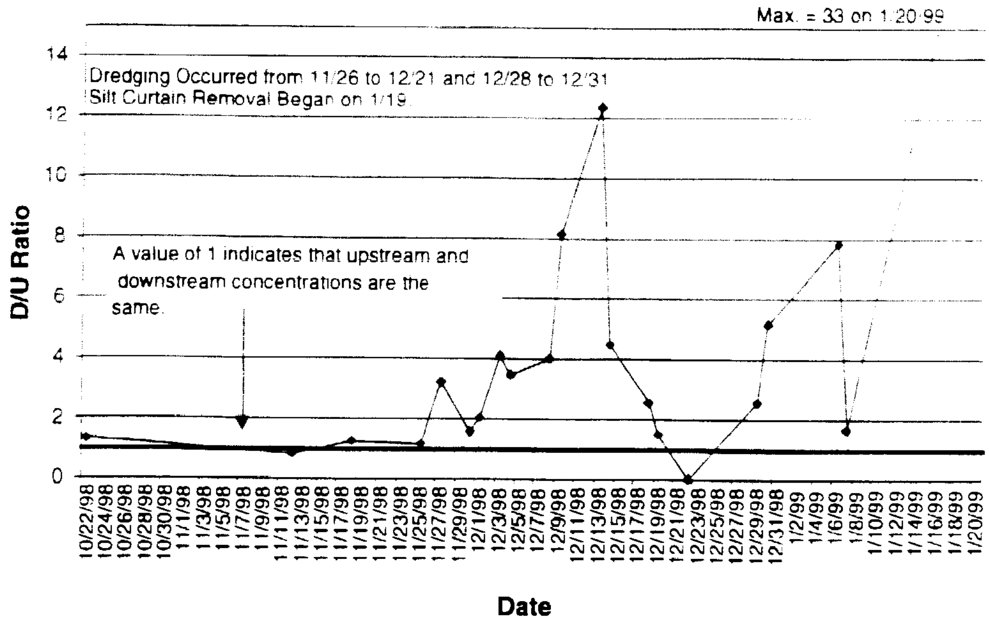
As shown on the above figure, the pre-dredge average surface sediment PCB concentration for Deposit N in 1998, was 16 ppm (BBL, 2000). The 1998 post-dredge average surface PCB concentration was calculated by BBL to be approximately 9 ppm. The 1999 post-dredge average surface PCB concentration is 14 ppm as reported by Foth & Vandyke (2000). Independent calculations by BBL result in a 1999 post-dredge average surface PCB level of 21 ppm.

The pre-dredging average sediment thickness was 2 to 3 feet over fractured bedrock in water depths of approximately 8 feet (Foth & VanDyke, 2000). Shallow bedrock at the site prevented over cutting beneath the sediment and resulted in residual sediment left behind. Post-dredge 1999 probing data collected from the west lobe of Deposit N showed that an average of 5 inches of PCB-containing sediment remained, with as much as 15 inches remaining in one portion of the deposit.

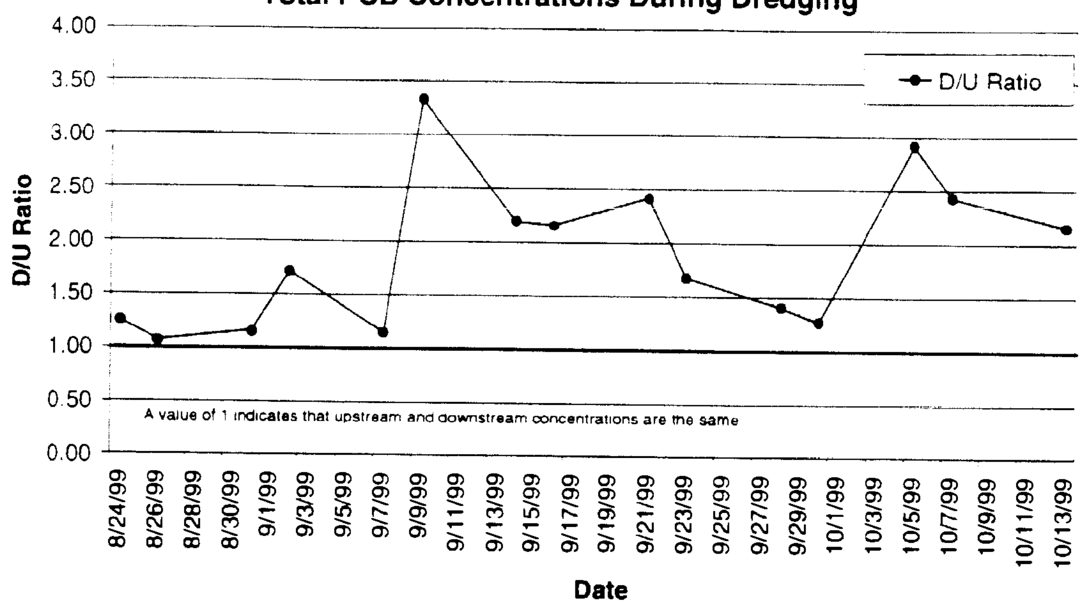
Resuspension Data:

Two rounds of dredging were conducted at Deposit N, the first during November and December 1998 and the second between August and October 1999. In 1998, the dredging area was surrounded by a silt containment system including an 80-mil high density polyethylene (HDPE) flexible plastic barrier and a silt curtain. In addition, two deflection barriers were used to direct water around the local paper mill water intake. No turbidity barrier was used during the 1999 dredging. However, a silt curtain was placed approximately 150 feet or less downstream of the dredge (Foth & VanDyke, 2000). Generally speaking, data from both Deposit N dredging events indicate higher PCB concentrations downstream of the dredging site during dredging, while pre-dredging upstream and downstream PCB concentrations are similar.

1998 Water Column Data - Ratio of Downstream To Upstream Total PCB Concentration



1999 Water Column Data - Ratio of Downstream to Upstream Total PCB Concentrations During Dredging



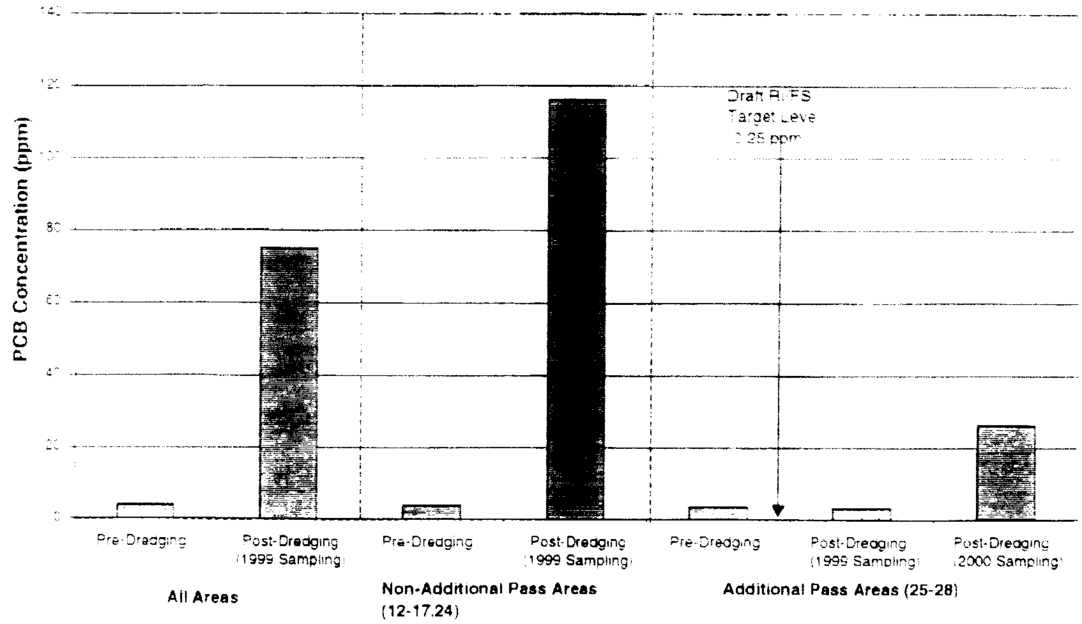
In 1998, the pre-dredging PCB concentrations in upstream and downstream samples were similar, averaging 15 nanograms per liter (ng/L) upstream and 15 ng/L downstream. As indicated in the above figures, evaluating the changes in the downstream to upstream PCB concentration (D/U ratio) indicates that downstream PCB concentrations during dredging exceeded upstream concentrations in both 1998 (by a factor of 1.5 to 12.4) and 1999 (by a factor of 1.1 to 3.3) (BBL, 2000). This trend was not evident in the pre-dredging samples. On average, downstream PCB concentrations were 4.3 times higher than upstream PCB concentrations during 1998 dredging and 1.9 times higher during 1999 dredging (BBL, 2000).

Fox River Sediment Management Unit 56/57 – Green Bay, Wisconsin

Sediment Data:
Sediment Management Unit (SMU) 56/57 is a 9-acre area located along the west bank of the Fox River in Green Bay, Wisconsin. Of the 117,000 cy of sediment with PCB concentrations greater than 1 ppm, 80,000 cy were targeted for removal. In August 1999, dredging began and removed approximately 31,500 cy of sediment (mainly from eleven 100-foot by 100-foot subunits) using a hydraulic horizontal auger dredge. The goal of this demonstration project was to understand the implementability, effectiveness and cost of a large-scale sediment removal project. Dredging continued through mid-October 1999, when review of survey information indicated that the dredging process was leaving a very uneven surface on the river bottom. WDNR directed the contractors to stop disturbing new areas and instead redredge areas that had already been disturbed. In December 1999, additional dredging passes were performed on small (30-foot by 30-foot) sections of four subunits designed to remove ridges in the sediment bed left from previous dredging. On average, the additional dredge passes targeted the removal of an additional six inches of sediment.

All of the funds allotted for this demonstration project have been expended with only one-third of the sediment volume removed. The project cost incurred thus far is approximately $9 million, which equates to a unit cost of approximately $317 per cy. However, sediment removal is not yet complete in SMU 56/57.

Average Pre- and Post-Dredging Surface (0-4") Sediment PCB Concentrations



Pre- and post-dredge PCB data were collected by BBL and Montgomery Watson. Pre-dredge surface PCB concentrations collected in the eleven dredged subunits averaged 3.6 ppm and ranged from 1.7 to 5.9 ppm (BBL, 2000). Two rounds of post-dredging sampling were conducted, the initial round in December 1999/January 2000 immediately following dredging and the second round in February 2000. The average surface PCB concentration in the eleven subunits increased to 75 ppm (range: 0.03 to 280 ppm) based on the December 1999/January 2000 sampling event. A subset of seven of the eleven subunits were sampled during the February 2000 events and the resulting average surface PCB concentration was 43 ppm (range: 16 to 110 ppm).

In those four subunits where an additional "cleanup" pass was performed, pre-dredge surface PCB concentrations were 3.5 ppm (range: 2.7 to 4.7 ppm). In December 1999/January 2000 surface PCB levels decreased slightly to an average of 3.2 ppm (range: 0.03 to 10.8 ppm), while the February 2000 sample results indicated an increase in PCB surface concentration to 26 ppm (range: 16 to 34 ppm) in these four subunits (BBL, 2000).

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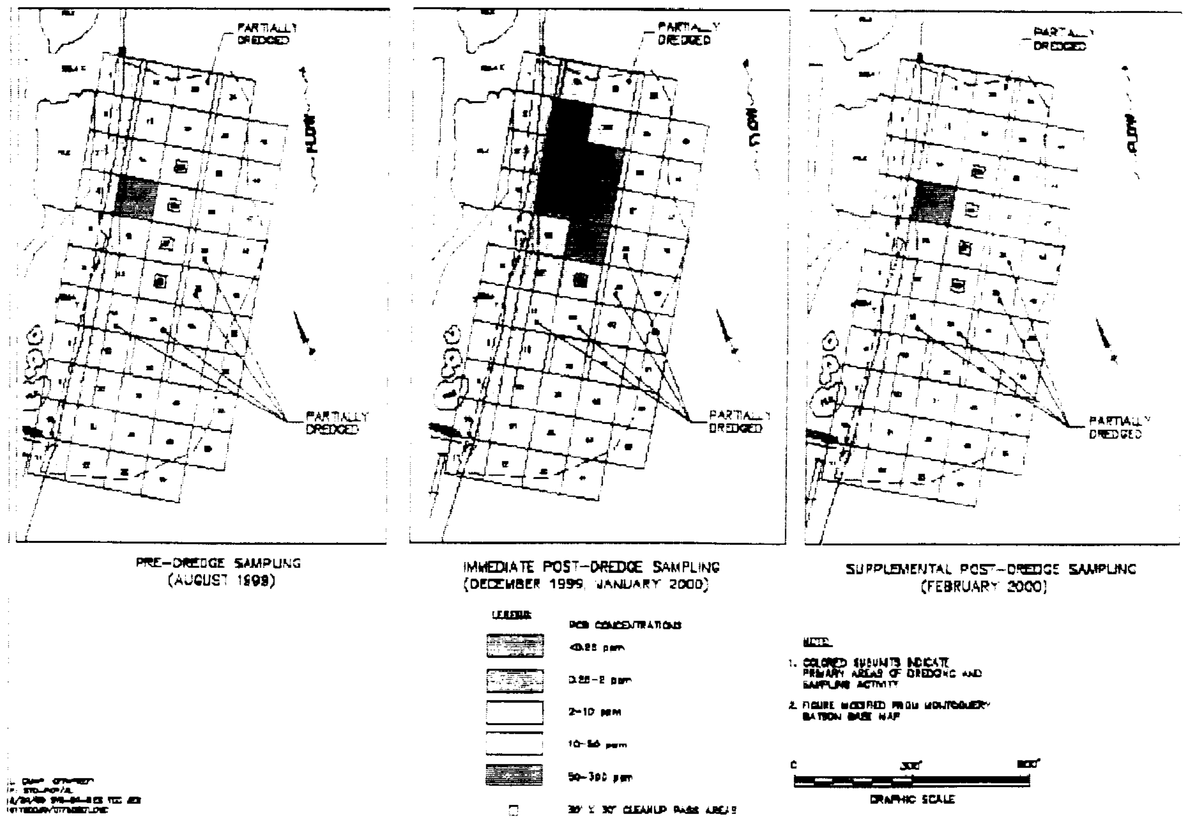
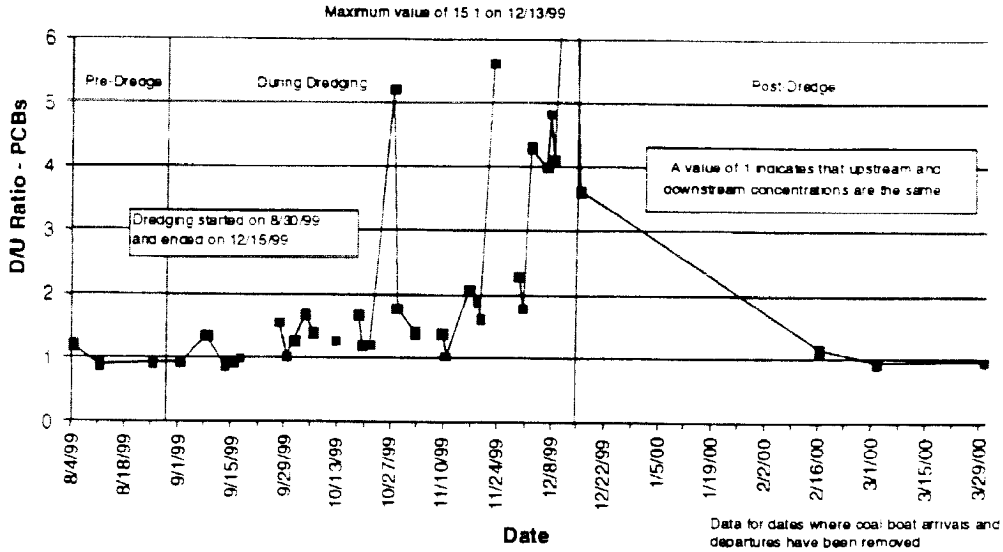


The pre-dredge surface PCB concentration in those seven subunits that did not receive a cleanup pass was 3.7 ppm (range: 1.7 to 5.9 ppm). Results of the December 1999/January 2000 sampling indicate that average surface PCB concentration in these seven subunits to be 116 ppm (range: 32 to 280 ppm). Only three of these seven subunits were sampled in February 2000 and the resulting average surface PCB concentration was 65 ppm (range: 40 to 110 ppm) (BBL, 2000). Surface sediment concentrations pre-, during- and post-dredging are shown in the above figure.

Dredged sediments were dewatered and disposed (as an in-kind service) at a landfill operated by the Fort James Corporation.

Resuspension Data:
The SMU 56/57 dredge area was enclosed by a silt curtain. PCB levels in the water column were monitored pre-, during- and post-dredging. Generally speaking, PCB concentrations were higher downstream of the removal area than upstream during dredging.

Water Column Data - Ratio of Downstream To Upstream Total PCB Concentration



As shown in the adjacent figure, water column PCB data was analyzed through an evaluation of the downstream to upstream PCB concentration (D/U) ratio. Samples collected during coal boat delivery times were removed to eliminate downstream bias, which may be caused by resuspension due to coal boat travel. The pre-dredging upstream and downstream average PCB concentrations were 53 ng/L and 52 ng/L, respectively (resulting in a D/U ratio of approximately 1.0). The overall during-dredging D/U ratio indicates that, on average, PCB concentration were higher in downstream samples by 2.6 times after removing sampling dates that coincided with coal boat arrivals and departures.

Duwamish Waterway – Seattle, Washington

Sediment Data:

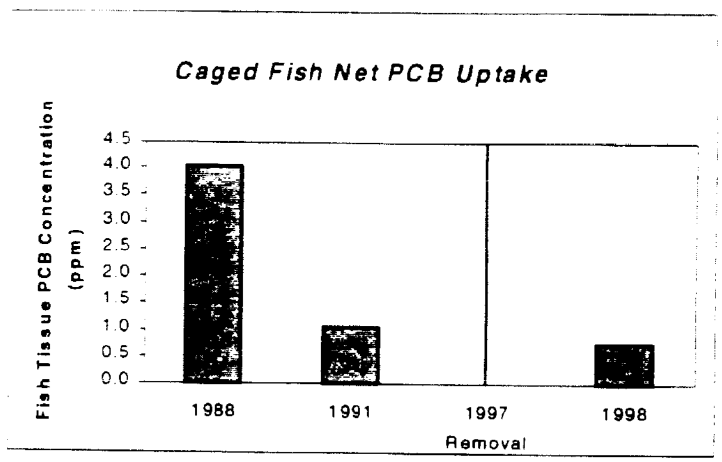
A dredging effort was implemented at Slip 1 of the Duwamish Waterway to cleanup sediment from a 255-gallon PCB spill which occurred on September 12, 1974. Pre-removal PCB concentrations at the spill site were detected in excess of 30,000 ppm (Blazevich, 1977). The first phase of remediation was conducted in October 1974 using divers with hand-held dredges to remove approximately 50 cy of sediment (Willmann, 1976). Post-phase I removal concentrations ranged from 1,200 to 1,900 ppm (Blazevich, 1977). Prior to implementation of Phase II dredging activities in 1976, surficial (top 1 foot) PCB concentrations ranged from non-detect to 42 ppm (average of 4 ppm). Extensive dredging was performed with a PNEUMA pump dredge in an effort to achieve maximum PCB removal near the spill source. After the first dredging pass, sediment PCB concentrations increased to as much as 2,400 ppm. Thus, several passes were employed to achieve maximum removal. According to Willmann (1976), it was originally thought that 4 feet of dredging would be required to sufficiently reduce the concentrations. However, it was found that surface sediment still contained about 200 ppm after 6 feet of material had been removed, so additional dredging to hardpan (a depth of about 10-12 feet) was performed and resulted in residual PCB concentrations of about 10 ppm (Willmann. 1976). Overall. the post-dredge surficial sediment PCB concentrations ranged from 0.2 to 140 ppm (average of 7 ppm). which were higher than the Phase II pre-removal concentrations of non-detect to 42 ppm (average of 4 ppm).

River Raisin – Monroe, Michigan

Sediments were removed from an embayment area of the River Raisin adjacent to a former outfall of the Ford Monroe facility. Approximately 27,000 cy of soft sediment were removed from the embayment between April and October 1997 using a mechanical clamshell operation. A silt containment system was also used at the work area perimeter [Metcalf & Eddy (M&E), 1998].

Sediment Data:
Pre-removal surface concentrations ranged from 11 to 28,000 ppm (average of 4,130 ppm) and subsurface concentrations ranged from 0.78 to 29,000 ppm (average of 6,510 ppm) (M&E. 1993). The cleanup goal for this site was removal of PCBs >10 ppm. Despite removal efforts, potential exposure and risk may not have been reduced because, according to M&E (1998), "confirmatory sample collection activities in many dredge-cells were revealing that sediment remained, even though prior dredging to refusal had occurred." Post-removal PCB levels ranged from 0.54 to 20 ppm (arithmetic average of 9.7 ppm), where only four of the 14 data points were usable for the post-dredging calculation. The other seven had immunoassay results >50 ppm and were redredged: however no sediment reportedly remained from which to obtain a final confirmatory samples. Two of the suspected sources of sediment were "a 0-0.5 foot layer of sediment deposited following resuspension during dredging" and "sloughing of sediment outside of the SRA (sediment removal area) into the SRA along the base of the silt curtain" (M&E. 1998). Cells not meeting the 10 ppm cleanup goal in surficial sediments were redredged until PCBs concentrations were less than 10 ppm in the cells.

Fish Data:
As shown on the figure at right, the Michigan Department of Environmental Quality (MDEQ) performed pre-removal caged fish studies at the mouth of the River Raisin in 1988 and 1991 (remediation occurred in 1997). The total PCB concentration was 4.06 ppm in 1988 and 1.07 ppm in 1991 (MDEQ. 1998). In comparison. the PCB concentration after removal in 1998 was approximately 0.77 ppm. The 1991 concentration was



about 25% of the 1988 concentration (a decrease of about 1 ppm/year), and the 1998 concentration was about 72% of the 1991 concentration (a decrease of about 0.04 ppm/year), thus indicating that natural recovery was taking place prior to removal activities and that removal activities did not have a marked effect in reducing the post-removal caged fish concentrations.

Manistique River and Harbor – Manistique, Michigan

At the Manistique River and Harbor site in Michigan, dredging has been performed in three areas (the North Bay, an area in the River, and the Harbor) to remove PCB sediments. Dredging at the site has been performed using a combination of diver-assisted and hydraulic cutterhead dredging. EPA's goal is to achieve a PCB concentration of 10 ppm at all depths in sediments.

Through the end of 1999, according to the USEPA, a total of less than 100,000 cy of sediment has been dredged and 41,800 tons of dewatered sediments have been shipped to off-site landfills for disposal. The table below summarizes the volumes removed by year.

Year	Volume Removed (cy)	Tons Disposed
1995	10,000 (2)	1,200 (2)
1996	12,500 (2)	2,100 (2)
1997	62,000 (3)	12,000 (3)
1998	31,200 (4)	12,600 (4)
1999	25,000 (5)	13,900 (5)
TOTAL	97,000	41,800

Notes:

1. The volumes are based upon USEPA Pollution Reports; volume to date modified by EPA in 1999 to 72,000 cy through 1998.
2. (2) indicates quantities removed from Area B, POLREP #15 and #20
3. (3) indicates quantities removed from Areas C and D, POLREP #40
4. (4) indicates quantities removed from Area D, POLREP #56
5. (5) indicates quantities removed from Areas B and D, POLREP #70

As of November 1999, the cost for the project is over $35 million. The original budget in 1995 was $15 million.

Initially, EPA expected the dredging to be completed by the end of 1997. Currently, EPA estimates that dredging will be completed by the end of 2000.

Sediment Data:
North Bay (Area B)

Pre-removal surficial sediment PCB concentrations in the North Bay ranged from non-detect to 62 ppm (average of 8.8 ppm) using data collected in 1995.

The EPA originally dredged the North Bay in 1995 and 1996. These activities were initially performed using diver-assisted dredging to remove sediment along with a layer of wood chips. Subsequent removal was then accomplished using a horizontal auger cutterhead dredge. In September 1996, the EPA declared that dredging operations were completed in the North Bay (Nied, 1996a). Post-dredging sampling of the North Bay by EPA in the fall of 1996 revealed that sediment with PCB concentrations greater than 10 ppm remained. In response, the EPA placed washed gravel in the North Bay in October 1996 to "improve the river bottom in this area as habitat for aquatic species as well as enhance containment of the contaminated residuals which could not be cost effectively recovered from beneath the debris layer during dredging" (Nied, 1996b).

In October 1998, BBL collected five sediment cores in the North Bay to confirm whether EPA had reached the 10 ppm PCB cleanup level. PCB concentrations in surficial (0-3 inches) sediment samples ranged from 1.3 to 1,300 ppm, with two of the five detections being greater than 10 ppm, and an overall arithmetic average of 270 ppm. Some of the subsurface intervals sampled also had PCB concentrations greater than 10 ppm. In April 1999, prior to dredging, EPA collected five cores in the North Bay. PCB concentrations in the surficial samples (0- to 1-foot) ranged from 16 to 116 ppm, and averaged 48 ppm. Based on the results of these sampling efforts, EPA decided to conduct additional dredging in the North Bay, which was conducted in May and June 1999.

After the additional dredging had ceased for the season in 1999, BBL collected nine sediment core samples from the North Bay. In the surficial interval (0-3 inches), PCB concentrations ranged from 0.25 to 15 ppm. One sample had a PCB concentration greater than 10 ppm. Six out of 13 subsurface (deeper than 3 inches) samples had PCB concentrations greater than 10 ppm, with a maximum PCB concentration of 620 ppm.

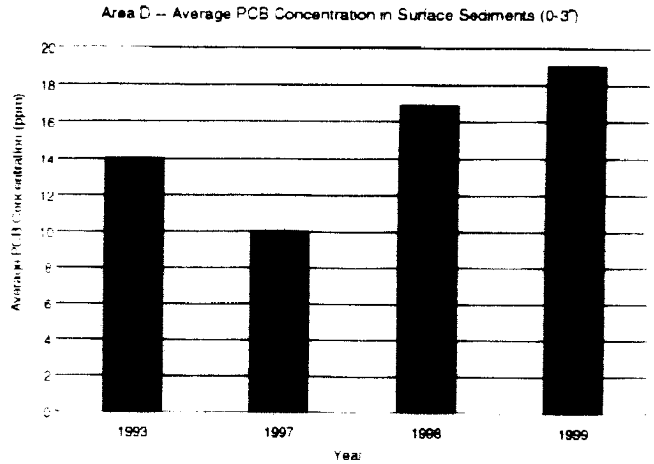
River Area (Area C)

In 1993, an interim geomembrane cap was installed as a temporary measure near an outfall. In 1997, the temporary cap was removed and the sediment was dredged. Sediment PCB concentrations were determined using immunoassay tests to assess whether the clean up goal of 10 ppm was reached. The data document that sediment PCB concentrations remained above 10 ppm. In fact over 20 percent of the samples showed that sediment above 50 ppm was left behind.

Harbor (Area D)

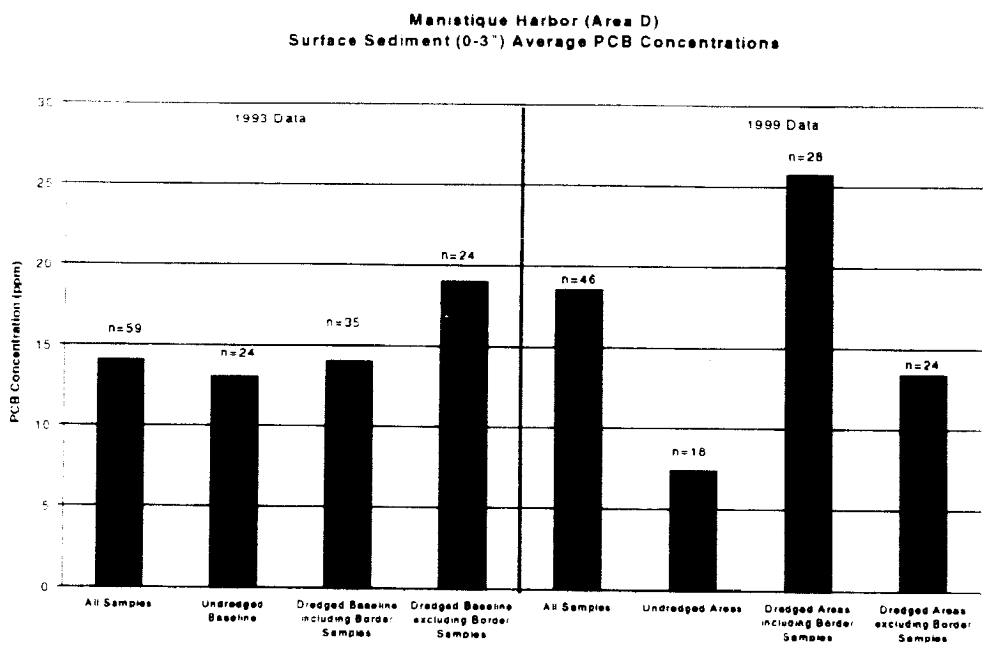
Pre-removal surficial sediment PCB concentrations in the Harbor ranged from non-detect to 340 ppm (average of 14 ppm) using data collected during the Engineering Evaluation/Cost Analysis (EE/CA).

After EPA completed its dredging activities in 1997, 1998, and 1999, BBL collected between 24 and 46 core samples within the harbor. In all years, the samples were distributed throughout the harbor area without bias toward dredged or undredged areas. The average surface sediment PCB data is summarized in the graph below.



In addition, data from 1993 was compared to data from 1999 to determine whether there was any difference between areas which were dredged and those which were not dredged. The delineation of areas dredged (as provided by EPA) was overlaid with the sampling locations in 1993 and 1999 to categorize locations as either within or outside dredged areas.

Given potential mapping inaccuracies, it is possible that some sample locations may be interpretable either way (hereinafter called border samples). Using best judgement, the border samples would be considered within the dredged areas. However, for completeness, both scenarios have the average surface sediment concentrations plotted below.



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The figure shows that while the average PCB concentrations in undredged areas in 1999 roughly two-fold lower than in 1993, this was not the case in dredged areas. The apparent decline in undredged areas may be evidence of natural recovery

In addition to sampling by BBL, EPA conducted pre-dredging surveys of the Harbor in 1998 and 1999. In 1998, EPA collected 112 samples in the Harbor, and PCB concentrations ranged from non-detect to 1,250 ppm and averaged 16 ppm. In 1999, EPA collected 124 cores in the Harbor. PCB concentrations in the surficial (0- to 1-foot) sediments ranged from non-detect to 1,096 ppm and averaged 30 ppm. The average concentration both years was greater than 10 ppm and increased from 1998 to 1999, generally consistent with BBL data.

EPA continues to have difficulties achieving the 10 ppm cleanup goal in the Harbor. At the end of the 1999 dredging season, EPA collected sediment samples in the Harbor which showed an average PCB concentration greater than 10 ppm. In the 151 grab samples collected by EPA, PCB concentrations ranged from non-detect to 340 ppm and averaged 20 ppm (compared to 19 ppm average using BBL data).

Water Data:
PCB data are available for surface water samples from the Manistique River and Harbor Site from the early 1980s to 1998. In the early 1980s, Marti and Armstrong (1990) collected five surface water samples from the mouth of the River, and in April-May 1994, EPA collected three surface water samples at the site as part of the Lake Michigan Mass Balance Study. These sample results are presented below:

Water Column Total PCB Concentrations (ppb)				
Sampling Period	**Range**	**Mean**	**No. of Samples**	**Reference**
Early 1980s	0.007 - 0.043	0.024 ± 0.015	5	Marti and Armstrong, 1990
April/May 1994	0.0002 - 0.0021	0.0009	3	EPA; LMMB Study
1995	ND – 0.49	0.10	102	EPA
1996	ND – 3.5	0.62	23	EPA
1997	ND – 0.81	0.26	10	EPA
1998	ND – 0.14	0.081	17	EPA

The average total water column PCB concentrations in 1994 were an order of magnitude lower than the early 1980s data. Considering EPA's surface water PCB data for 1995 through 1998 (during dredging), the mean PCB concentration was 0.19 ppb (range of 0.042 to 3.5 ppb), an order-of-magnitude or more higher than the pre-remediation concentrations. The annual means are as reported in the table above. Of all the years with water column data, the during-dredging periods show the highest mean PCB detections.

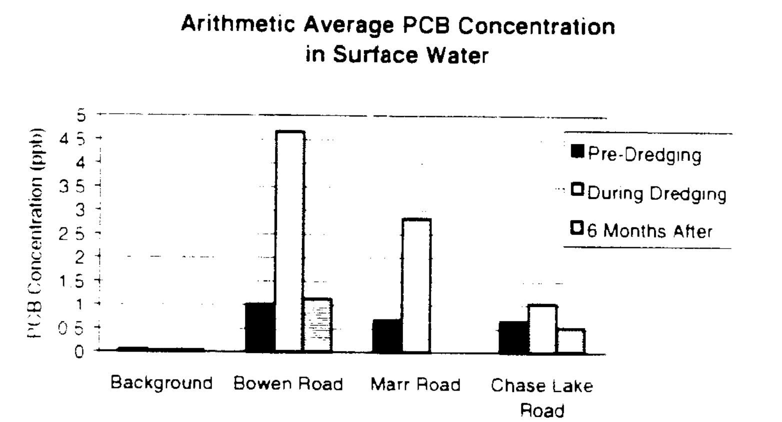
Silt containment has been used during dredging of all three areas. In the North Bay, silt containment included plastic sheeting with wooden shoring at the mouth of the Upper Bay and silt barrier (filter fabric). In the River Area, silt containment included silt barrier constructed from surplus wet felt from a nearby paper mill. In the Harbor, a silt barrier was used for containment.

In 1998, BBL performed sediment trap sampling in Manistique Harbor. The results were generally low; however three of the higher detections observed (9.5, 42, and 84 ppm) suggest resuspension of bottom sediments that may have been due to dredging related activity, including dredged sediment transport by barges to and from the work area. Since no pre-dredging data is available, comparisons with preremoval conditions are not possible.

South Branch of the Shiawassee River – Howell, Michigan

In 1982, a backhoe was used to remove PCB-containing sediment from around a factory discharge, and a dragline was used to remove PCB–containing sediments near Bowen Road, 1.2 miles downstream from the plant site. Small pockets of oily sediments also were vacuumed from this stretch. As discussed by Malcolm Pirnie, "although intended to clean up a total of eight miles of the river, the remediation project stopped at the end of 1982 with only 1.5 miles of river remediated. Cost overruns and the presence of contamination extending farther than initially anticipated were identified as reasons for the incomplete removal action" (Malcolm Pirnie, 1995). No post-removal verification sampling was performed to determine if the 10 ppm cleanup goal was achieved. Only visual and olfactory observations were used to determine the extent of dredging [Environmental Research Group (ERG), 1982].

Water Data:
Rice et al. (1984) investigated changes in PCB concentrations in surface water before, during, and after dredging. The results are summarized in the figure below. The two downstream locations show increases in PCB concentrations during dredging; however, the samples collected six months later do not show a significant decrease in PCB concentration when compared to the pre-dredge concen-trations. In fact, it was recognized that "dredging of sediments is likely to cause temporary resuspension of contaminants into the water column which can cause a temporary increase in tissue contaminant concentrations of aquatic biota. Dredging also removed indigenous benthic fauna, which can take years to reestablish" (Malcolm Pirnie, 1995).



Sediment and Fish Data:
The set of graphs presented below show total PCB concentrations in sediment and white sucker fillet samples from the Shiawassee River. Twenty years of data indicate that PCB levels in fish and sediment were undergoing a decline prior to and after the 1982 remediation, which limits the

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surficial sediment samples exhibited PCB concentrations ranging from 8.3 to 280 ppm (arithmetic average 81 ppm) (Baird and Associates. 1997).

Fish Data:
The WDNR measured whole-body PCB congener concentrations in caged fathead minnows at three locations before and after the sediment removal operation (Amrhein. 1997). Three cages were placed at each of three stations: a site in Cedar Creek upstream of Ruck Pond called Cedarburg Pond. a site within the downstream end of Ruck Pond. and a site downstream of the Ruck Pond Dam. located just upstream of Columbia Dam.

In July 1994. just before the start of removal. PCBs were measured in caged fathead minnows at the three stations. The average PCB concentrations were 0.12 ppm upstream. 24 ppm at the Ruck Pond station. and 12 ppm at the downstream station (7.1. 1.700. and 630 mg/kg lipid normalized PCB. respectively). The average PCB concentrations measured in caged fish in August and September 1995. about one year after remediation. were 0.09 ppm upstream. 4.2 ppm within the pond. and 11 ppm downstream (2.2. 170. and 360 mg/kg lipid normalized PCB. respectively). These PCB levels in the caged fish collected in Ruck Pond would. at face value appear to have declined 75 to 85%[1] on a wet-weight basis and approximately 90% on a lipid basis after remediation. However. caged fish PCB concentrations at the upstream "background" location also declined 25% wet weight and 70% on a lipid basis one year after remediation. and caged fish concentrations downstream of Ruck Pond declined 10% wet weight and 40% on a lipid basis. The declines upstream of Ruck Pond would indicate that other factors. such as natural recovery processes. or metabolism/feeding differences were occurring.

The other more important issue is that construction activities were taking place in the pond (e.g.. siphon installation. work boat traffic. etc.) during the pre-remediation sampling. In fact. all three cages in the pond were displaced from their original locations with one cage unrecovered. This all indicates that the pre-remediation cages in Ruck Pond should not be considered representative of pre-remedial conditions.

Waukegan Harbor – Waukegan, Illinois

Waukegan Harbor is approximately 37 acres in size and is located on Lake Michigan approximately 25 miles north of Chicago. Illinois. Remediation areas in the harbor included boat Slip #3 and the 10-acre Upper Harbor. For the Upper Harbor. EPA concluded that. based on modeling. residual sediment PCB concentrations of between 100 ppm and 10 ppm would result in a negligible PCB influx to Lake Michigan. Based on this. EPA set a 50 ppm PCB cleanup level for the Upper Harbor and calculated that 96% of the PCB mass would be removed from the Upper Harbor if the 50 ppm goal was met (EPA. 1984: 1989).

The original goal of the Record of Decision (ROD) was elimination of PCB flux to Lake Michigan (restoration of the harbor fishery was not a specific objective). Regarding the effectiveness of sediment removal. EPA stated in the ROD's Responsiveness Summary that. "Remedial alternatives based on a sediment cleanup level below 50 ppm raise technical and cost-effectiveness concerns. EPA had to consider the technical limitations inherent in the available

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[1] Two exposure periods occurred in Ruck Pond. 29 and 37 days. Average PCB levels were greater in the longer exposure. indicating that the fish were not at steady state with respect to their exposure sources. Therefore. pre-and post-remediation comparisons were carried out independently for each exposure period. The range of values given reflects the two comparisons.

The above figure provides average total PCB concentrations in carp collected from the Upper Harbor (with range representing 2 standard errors). While these graphs seem to indicate that PCB levels were lower in 1993 (compared to 1991), they also indicate a general increasing trend since dredging. The lack of adequate pre-remediation data and the fact that fish tissue concentrations have generally been rising since 1994 indicate the presence of other factors that limit the ability to differentiate the effects of various remedial activities (removal and/or containment) in the harbor. In addition, such a significant drop in PCBs from 1991 is inconsistent with expected trends in tissue PCB levels due to rate of natural depuration of PCBs by fish.

New Bedford Harbor – New Bedford, Massachusetts

In 1976, the EPA detected high concentrations of PCBs in marine sediments over a widespread area of New Bedford Harbor (i.e., PCB concentrations up to 250,000 ppm were reported in 1982). From May 1988 to February 1989, the United States Army Corps of Engineers (USACE) performed a full-scale dredging pilot study at the site to assess the performance of dredge equipment, the suitability for the removal of contaminated sediments, and the recommended procedure for operation (USACE, 1990). Three hydraulic dredges were evaluated: hydraulic cutterhead, horizontal auger (mudcat), and matchbox. The study used two small shallow (water depth less than 5 feet) dredging areas, and approximately 10,000 cy of sediments were removed (USACE, 1990).

Sediment Data:
Prior to removal, both test areas contained higher concentrations in the surface (top 6-inch) sediments (i.e., average of 226 ppm in Area 1 and 385 ppm in Area 2) compared to subsurface concentrations, which were one to three orders of magnitude lower. Post-removal average residual sediment (top 3-inches) concentrations for each of the dredges tested were as follows:

- cutterhead (Area 1): 80 ppm;
- horizontal auger (Area 1): 66.4 ppm;
- cutterhead (Area 2): 8.6 ppm; and
- matchbox (Area 2): 5.4 ppm.

Note that a theoretical versus actual residual PCB concentration evaluation also was performed, which showed that actual post-removal concentrations were much higher than those theoretically predicted.

Following performance of the Pilot Study, the remediation for the New Bedford site was split into two operable units. EPA issued a ROD for the first operable unit (hot-spot areas, those areas with greater than 4,000 ppm PCBs) in April 1990. The 1990 ROD called for dredging of approximately 10,000 cy of sediment with PCB concentrations greater than 4,000 ppm, dewatering (with effluent treatment), incineration of dewatered sediment, and stabilization of the incineration remains (EPA, 1990a). The dredging portion of this phase was initiated in April 1994 and was completed in September 1995. Over the 1994-1995 construction period, a total of about 14,000 cy were dredged and placed in a confined disposal facility (CDF) nearby, pending determination of final treatment and/or disposal. Pre-dredging surficial sediment samples (upper 2 feet) had PCB concentrations ranging from 4,000 to 200,000 ppm, with an arithmetic average of 25,000 ppm (EPA, 1999a). Initial post-dredging sampling showed up to 3,600 ppm PCBs remained after dredging (personal communication with P. L'Hreaux of USACE, 1996). After the completion of the project, it was estimated by Ebasco Services and the EPA, that only about 45% of the PCBs in the Harbor had been removed by dredging (EPA, 1997).

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Appendix C

Effectiveness of Sediment Removal: An Evaluation of EPA Region 5 Claims Regarding Twelve Contaminated Sediment Removal Projects

EFFECTIVENESS OF SEDIMENT REMOVAL:

An Evaluation of EPA Region 5 Claims Regarding Twelve Contaminated Sediment Removal Projects

Submitted to the:

National Academy of Sciences
Committee on the Remediation of PCB-Contaminated Sediments

Submitted by:

The Fox River Group
as a supplement to the presentation by:
J. Paul Doody, P.E.
Blasland, Bouck & Lee, Inc.

September 27, 1999
Green Bay, Wisconsin

TABLE OF CONTENTS

SECTION 1 – INTRODUCTION

Representatives from Region 5 of the U.S. Environmental Protection Agency (EPA) have published articles and made a series of public presentations promoting the "success" of 12 contaminated sediment removal projects.[1] A close examination of the conclusions drawn by EPA Region 5 raises serious concerns about both the accuracy of the claims and the absence of adequate supporting data to substantiate the claims. For example, in one case broad conclusions are drawn from a single pre-dredging data point; in other cases conclusions are made without regard to sampling location, time, age of fish, length of exposure, or a variety of other parameters; and in still other cases conclusions are advanced by choosing some data points and not others. Despite these weaknesses, EPA presents its findings as conclusive without properly qualifying those conclusions based on known uncertainties and limitations of the underlying data.

EPA cites the 12 projects listed in Table 1 as proof that sediment removal is effective in all cases. If anything, however, these projects prove that remedies can be evaluated only on a site-specific basis. For example, can the Shiawassee River project (removal of just 1,805 cubic yards over 15 years ago) or Ruck Pond (a dry excavation while Cedar Creek was diverted through pipes) really be cited as relevant precedents for selecting appropriate remedies for large and complex river systems? Does mass removal make sense as a general rule when each of the projects cited by EPA demonstrates that contaminants are always left behind to one degree or another after dredging? The standard after all is risk reduction – not mass removal – as reflected in CERCLA, 42 U.S.C. 9605(a)(8)(A), and EPA guidance documents. EPA's Contaminated Sediment Management Strategy (EPA, 1998) requires that EPA "consider a range of risk management alternatives" to reduce risk, including source control, natural attenuation, containment, and removal alternatives.

Focusing on risk reduction, as opposed to mass removal, may make decisions more challenging and complex, but an appropriate understanding of the factors driving risk in aquatic systems (e.g., the availability of contaminants in the biologically active zone of surface sediments) is necessary to improve the health of our lakes, rivers, and harbors. Dredging may very well have its place in certain circumstances, but from a national policy perspective, the focus has to be on the proper management of sediment to reduce risk. These decisions will have to be made on a case-by-case basis reflecting the unique characteristics of each affected water body and the unique physical conditions influencing current and future exposure potential within each system.

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[1] For example, EPA's presentations have included "USEPA Sediment Cleanups: Results and Costs of Dredging Projects," given during a televised public information forum called "The ABCs of PCBs" (hosted by the Appleton, Wisconsin chapter of the League of Women Voters), and a June 7, 1999 presentation to the National Academy of Sciences Committee on the Remediation of PCB-Contaminated Sediments. Portions of the presentation materials and related information have been published by EPA Region 5 staff in an article titled "Long-Term Benefits of Environmental Dredging Outweigh Short-Term Impacts," written by James J. Hahnenberg and appearing in *Engineering News Record* (Hahnenberg, 1999).

Table 1 - Sediment Removal Projects Evaluated by EPA Region 5	
Project Name/Location	**Sediment Removed (cubic yards)**
Dredging Projects	
Black River, OH[1]	60,000
Lake Jarnsjon, Sweden	196,000
Manistique River/Harbor, MI[2]	72,000
River Raisin (Ford Outfall), MI	28,500
St. Lawrence River (GM Massena), NY	13,300
Sheboygan River, WI	3,800
Shiawassee River, MI	1,805
Waukegan Harbor, IL	38,300
Dry Excavation Projects	
Bryant Mill Pond, MI	165,000
Ottawa River Tributary, OH	8,000
Ruck Pond, WI	7,730
Willow Run Creek, MI	450,000

[1] Contaminant of concern is PAHs, not PCBs.
[2] In progress: value is total volume removed through the end of the 1998 construction season, as reported by EPA.

Although there is limited monitoring data for the 12 projects cited by EPA, scientists and engineers from Applied Environmental Management, Inc. (AEM), Blasland, Bouck & Lee, Inc. (BBL), and others undertook an evaluation to: 1) identify and reconstruct how EPA may have reached its findings (primarily the claims of several-fold reductions in fish tissue concentrations as a result of sediment removal) and 2) provide a critical review of EPA's claims using all data available in our files and the "Major Contaminated Sediment Sites Database" (AEM, 1999) for the highlighted projects. As noted in Table 1, eight of the 12 projects involved dredging technology, and four relied upon dry excavation techniques. Eleven of the 12 projects targeted polychlorinated biphenyls (PCBs) for remediation, and one targeted polycyclic aromatic hydrocarbons (PAHs).

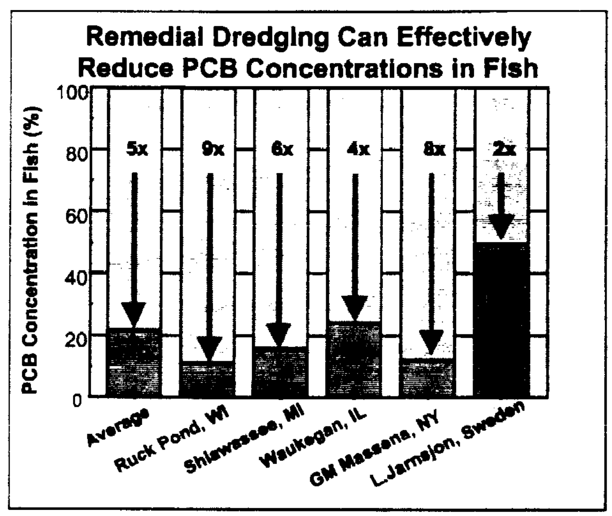

Figure 1 - This is a reproduction of the summary graphic presented by EPA Region 5 during a June 1999 presentation to the NAS Committee on the Remediation of PCB-Contaminated Sediments. The five projects cited formed the basis for EPA's claim that sediment removal resulted in an average 5-fold decrease in fish PCB concentrations.

Section 2 of this paper focuses on EPA's use of fish tissue data as the basis for reaching conclusions regarding the effectiveness of sediment removal, and provides a detailed review of the five case study projects EPA discussed during its June 1999 presentation to the National Academy of Sciences (NAS) Committee on the Remediation of

PCB-Contaminated Sediments (EPA's summary figure is reproduced for reference as Figure 1). In response to that presentation, J. Paul Doody, P.E., a principal engineer at BBL, presented a summary of our evaluation of the five case studies to the NAS committee during its meeting in Green Bay, Wisconsin on September 27, 1999. The five case study projects are the Shiawassee River in Michigan, Lake Jarnsjon in Sweden, Waukegan Harbor in Illinois, the St. Lawrence River in New York, and Ruck Pond in Wisconsin.

Section 3 presents our review of three other broad conclusions made by EPA Region 5 regarding the effectiveness of sediment removal: 1) contaminant mass removal is the primary measure of remedial success, 2) short-term adverse impacts of dredging are minor, and 3) unit costs tend to decrease with increasing scale of sediment removal.

Section 4 presents an overall summary of this paper and our findings.

SECTION 2 – EVALUATION OF EPA REGION 5 CASE STUDY PROJECTS

EPA Region 5's claims of reductions in contaminant concentrations in fish tissue are based on three hydraulic dredging projects (Lake Jarnsjon, Waukegan Harbor, and St. Lawrence River/GM Massena), one mechanical dredging (i.e., wet excavation) project (Shiawassee River), and one mechanical "dry" excavation project after the overlying water column was drained (Ruck Pond). A careful evaluation of the facts for these five case studies provides findings substantially different from those of EPA. This section presents our review of how EPA Region 5 may have reached its conclusions and offers alternative findings and supporting rationale that are apparent from the five projects. We reached three primary conclusions as a result of our evaluation:

- EPA has not demonstrated that the sediment removal actions at the cited projects reduced PCB exposure and risk.
- Reduction of PCB concentrations in fish is a meaningful measure of risk reduction, but the uncertainty associated with limited data availability, data quality concerns, and EPA's selective use of data do not support EPA's conclusions regarding the effects of sediment removal on fish at these sites.
- EPA's analysis does not differentiate the effectiveness of sediment removal from that of several other factors such as source control, containment, capping, or natural attenuation.

Our basis for reaching these conclusions is discussed below within the context of the five case studies highlighted by EPA Region 5.

2.1 – Shiawassee River, Michigan

This Superfund site includes the former Cast Forge Steel Company aluminum die-cast facility and 8 miles of the South Branch Shiawassee River in Howell, Michigan. The South Branch is 15 to 30 feet wide, with a depth of several feet and a floodplain ranging from approximately 100 to 300 feet wide. The river features numerous bars and mud flats, as well as moderate scour areas. Considerable blockage occurs as a result of deadfalls and beaver activities. The waterway is a small river with nominal flow of approximately 15 cubic feet per second (cfs) and spring floods reaching 75 cfs.

The Shiawassee River, looking upstream from Bowen Road, which is approximately 1.2 miles downstream of the Cast Forge Plant – the reach that was remediated in 1982.

The Shiawassee River received discharges of PCBs in hydraulic fluid and wastewater until the 1970s. A Consent Judgment in 1981 led to a removal action in the river with a cleanup goal of 10 parts per million (ppm) PCBs. In 1982, a backhoe was used to remove PCB-containing material from around the discharge area at the plant site and a dragline was used to remove contaminated sediments from an area in the river near Bowen Road, which is about 1.2 miles downstream of the Cast Forge facility. In addition, small pockets of stream sediments exhibiting an oily appearance were vacuumed from this 1.2-mile reach of the river (ERG, 1982). The remedial action resulted in removal of 1,805 cubic yards of sediments, but no sediment samples were collected to verify achievement of the cleanup goal. Removal was stopped at the end of 1982 due to exhaustion of funds and the presence of PCB contamination extending farther downstream than anticipated.

To assess the effectiveness of the cleanup, University of Michigan researchers measured PCB concentration changes in fish and surface water and evaluated the potential for bioaccumulation of PCBs in the river ecosystem (Rice and White, 1987). Caged fish and clam studies were performed in the river before, during, and after remediation. At all locations downstream from the plant site and in the area of removal, the study indicated an increase in the bioavailability of PCBs following remediation. At the Bowen Road sampling location, for example, the concentration of PCBs (dry weight) in caged fathead minnows increased from 64.5 milligrams per kilogram (mg/kg) to 88 mg/kg after remediation. This increase in concentration was cited as a short-term impact in EPA presentations, but the increase points to the likelihood that the residual PCBs remaining at the sediment surface after dredging increased exposure.

EPA's presentation of its evaluation is limited to just one chart comparing 1981 pre-remediation fish data with 1994 post-remediation data. This approach omits important information such as species and age of fish, type of analysis (fillet or whole body), location in the river, whether the reported concentrations were discrete values or averages, and fish tissue data from years other than 1981 and 1994.[2] EPA Region 5 relies on limited fish data collected 13 years apart, which ignores other available data, and attempts to use these selective data to illustrate a long-term 6-fold reduction in fish tissue concentrations resulting from the 1982 removal project. EPA's approach is misleading and greatly oversimplifies the rigorous approach that this kind of data analysis requires.

To provide a more careful evaluation and to fill in the missing information, we consulted two documents prepared for the Michigan Department of Natural Resources (MDNR): a remedial investigation (RI) report for the South Branch (Warzyn, 1992) and a report to develop sediment quality objectives for PCBs (Malcolm Pirnie, 1995). These documents provide a great deal of additional data on sediment and fish tissue PCB concentrations over a period of years. Table 2 provides a summary of that data. Note that the fish tissue data are for white sucker, which was the only species of fish sampled during each sampling event between 1977 and 1994.

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[2] In fact, this type of important qualifying information was typically missing from the charts presented by EPA Region 5 for each of the five case studies cited as demonstrating reductions in fish tissue concentrations.

Table 2 - Average PCB Concentrations in Sediments and Caged Fish (white sucker) from the South Branch Shiawassee River				
	Bowen Road (1.2 miles downstream of plant)		Marr Road (3.4 miles downstream of plant)	
Year	Sediment (mg/kg dry wt.)	Fish (mg/kg wet wt.)	Sediment (mg/kg dry wt.)	Fish (mg/kg wet wt.)
1974	530	--	97	--
1977	18.6	76	44	47
1980	40[1]	--	9.9[1]	--
1981	75[1]	19	14	6.7
1982	*Remediation performed*			
1984	--	4.2	--	--
1987	5.7[1]	--	3.3[1]	5
1994	0.72	2.56	0.59	1.7

[1] Average of duplicate samples. All other entries are average values as reported in Malcolm Pirnie (1995).

Data source: Malcolm Pirnie (1995) Tables 2-1 and 2-2.

The data reveal that at Marr Road, which is 3.4 miles downstream from the plant and about 2 miles downstream of Bowen Road, PCB concentrations in white sucker samples averaged 47 mg/kg in 1977, but declined to 6.7 mg/kg in 1981 *before remediation took place*. In 1987, five years after sediment removal, remediation did not appear to have had much effect in reducing white sucker PCB concentrations beyond rates already under way from other causes – average concentrations decreased from 6.7 mg/kg in 1981 to 5 mg/kg in 1987 (declines continued through 1994 as well). Similar trends are seen in sediment concentrations at both locations. The RI report (Warzyn, 1992) attributes the reductions in white sucker PCB concentration primarily to natural attenuation, although it is important to note that source control measures implemented at the plant in the late 1970s and early 1980s likely contributed to the observed declines.

Between the plant and Bowen Road, the 1.2-mile reach where remediation took place, dredging may have had some impact on reducing white sucker PCB concentrations. The data for the Bowen Road sampling station show that natural recovery processes were reducing PCB concentrations substantially prior to 1982. However, it is possible, but far from certain as EPA would have one believe, that dredging contributed to the reductions in sediment and fish tissue PCB concentrations seen after 1981 at either the Bowen Road or Marr Road locations.

The uncertainty regarding whether any reductions in fish tissue concentrations occurred due to sediment removal is best illustrated by the trends evident on Figure 2. The graphs for both Marr Road and Bowen Road depict trends that are approximated by straight lines (note log scale), and there is no pronounced acceleration

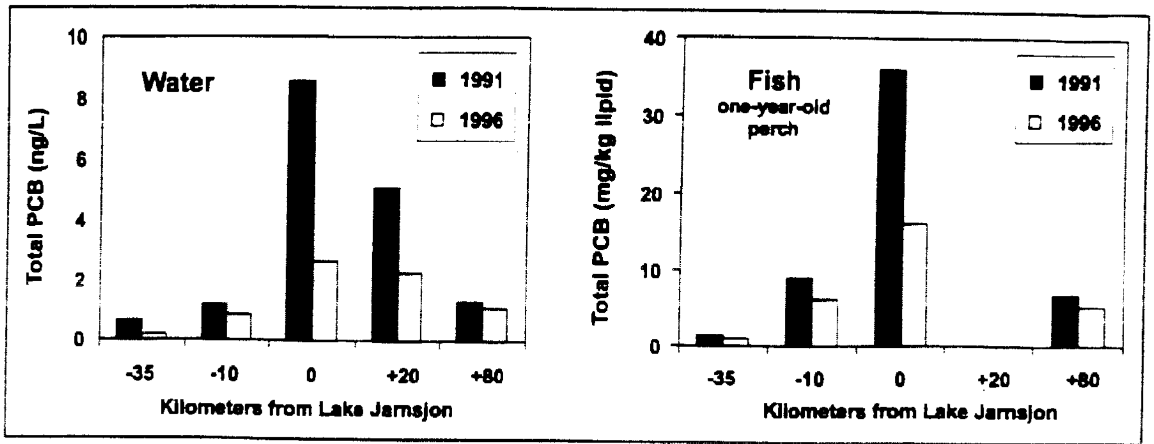
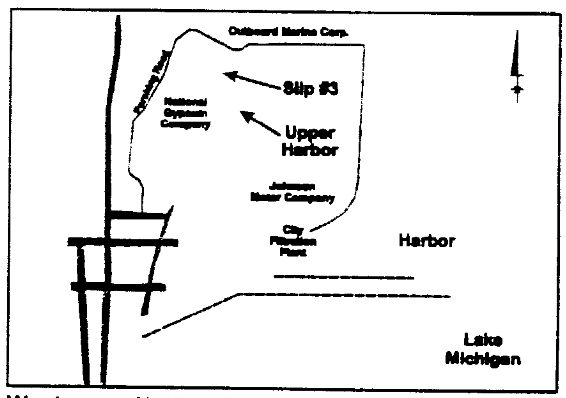


Figure 3 - Total PCB concentrations in fish (one-year-old perch) and water from the Eman River, comparing 1991 pre-remediation levels with 1996 post-remediation levels. Spatial trends are also apparent and indicate that while PCB concentrations decreased by approximately 50% in Lake Jarnsjon, upstream and downstream concentrations were also on the decline likely due to ongoing system-wide natural recovery processes. Finally, it is apparent that even after dredging the entire bottom of Lake Jarnsjon, lake sediments remained a dominant source of PCBs to fish and the water column.

Despite large-scale dredging, PCB levels in fish and surface water after remediation remained greatest in the lake as compared to both upstream and downstream locations. This means that the sediments of the lake remained an important source of PCBs to fish despite dredging an estimated 97% of PCB mass from the entire lake bottom. Taken together, these data indicate that the decline measured at Lake Jarnsjon, and the Eman river as a whole, is at least partly due to system-wide natural recovery processes operating both before and after remediation (Bremle and Larsson, 1998). These observations limit the ability to differentiate the effects that dredging may have had versus the apparent natural recovery processes operating within the system, and call into question the basis of EPA Region 5 claims about the project.

2.3 – Waukegan Harbor, Illinois

Waukegan Harbor is approximately 37 acres in size and is located on Lake Michigan approximately 25 miles north of Chicago, Illinois. Areas targeted for remediation in the harbor included boat Slip #3 and the 10-acre Upper Harbor (see map). For the Upper Harbor, EPA concluded that, based on modeling, residual sediment PCB concentrations of between 100 ppm and 10 ppm would result in a negligible PCB influx to Lake Michigan. Based on this, EPA set a 50 ppm PCB cleanup level for the Upper Harbor and calculated that



Waukegan Harbor is located on Lake Michigan north of Chicago, Illinois. In 1991 and 1992, the Upper Harbor and Slip #3 were remediated.

96% of the PCB mass would be removed from the Upper Harbor if the 50 ppm goal was met (EPA, 1984, 1989).

The original goal of the Record of Decision (ROD) was elimination of PCB flux to Lake Michigan (restoration of the harbor fishery was not a specific objective). Regarding the effectiveness of sediment removal, EPA stated in the ROD's Responsiveness Summary that, "Remedial alternatives based on a sediment cleanup level below 50 ppm raise technical and cost-effectiveness concerns. EPA had to consider the technical limitations inherent in the available dredging technology. Any dredging technique would involve some resuspension of sediment into the water column, and resettling back into the sediment. It may be difficult to assure that lower sediment levels could be achieved given the technological limitations...As further explained, implementation of the proposed remedy essentially eliminates PCB influx to the Lake from the site."

In late 1991 and early 1992, a total of 6,300 cubic yards of sediment with PCB concentrations greater than 500 ppm were hydraulically dredged from Slip #3, and 32,000 cubic yards were hydraulically dredged from the Upper Harbor. Slip #3 was abandoned and prepared as a permanent containment cell. The 6,300 cubic yards were treated by thermal desorption to remove PCBs and then placed in the cell. The 32,000 cubic yards from the Upper Harbor were pumped from the dredge directly to the cell, and then the cell was capped. The dredging of sediments (primarily organic silts) in 10 acres of the Upper Harbor was completed to a designated depth and to a designated sediment layer such as clay till or sand. Characterization data had shown the underlying clay till and sand layers were only slightly contaminated with PCBs. Sampling was performed during dredging to determine sediment consistency (i.e., to determine if the clay or sand layer had been reached), but not to measure residual PCB concentrations (Canonie Environmental, 1996).

No formal post-removal monitoring program was implemented following completion of the dredging, but in April 1996 (over four years after dredging was completed) Illinois EPA reported the results of "...Harbor sediment samples collected to document the effectiveness of dredging." Thirty surface sediment samples (3-inch depth) were collected from 29 locations. Eleven of the samples were archived in a freezer and unanalyzed, and two sample bottles were broken in transit. Results for the other 17 samples (one duplicate) showed PCB concentrations ranging from 3 mg/kg to 9 mg/kg.[4] Six of the 17 samples were from within the 10 acres of harbor that were dredged and had PCB concentrations of 5 mg/kg to 8 mg/kg. However, these 1996 sediment data are of limited value because no information is presented on physical characteristics of the

[4] The 17 samples were also analyzed for other parameters. The report (Lesnak, 1997) states that all sediment samples contained arsenic (11 to 120 mg/kg), copper (46 to 228 mg/kg), and lead (45 to 188 mg/kg) at levels that classify them as "heavily polluted" based on the guidelines for pollution classification of Great Lakes harbor sediments. Metals, however, were not a consideration in the 1984 ROD or the 1989 ROD Amendment.

in the reduction of fish tissue concentrations related to the remediation event in 1982. The data could just as well be used to support claims of approximately 6-fold reductions at Marr Road and 4-fold declines at Bowen

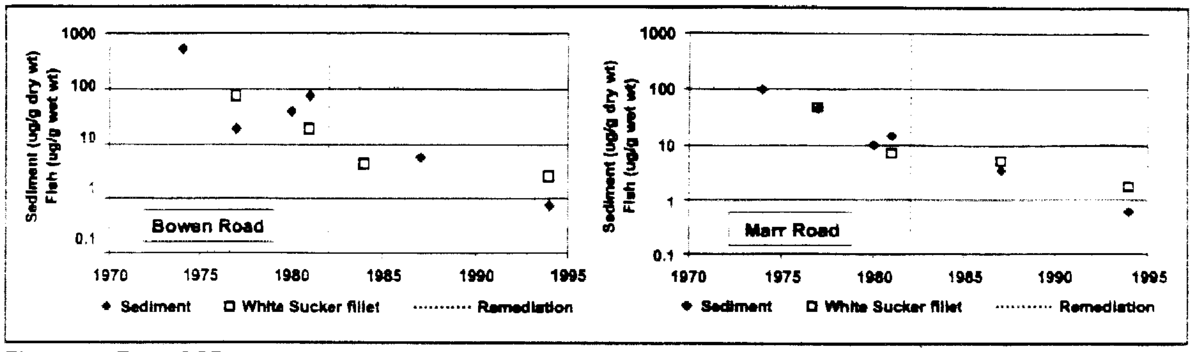


Figure 2 - Total PCB concentrations in white sucker fillet and sediment samples from the Shiawassee River. Twenty years of data indicate that PCB levels in fish and sediment were undergoing a decline prior to and after the 1982 remediation, which limits the ability to differentiate the effects of remediation versus other processes such as natural attenuation or source control. Note that data are plotted on a log scale.

Road between 1977 and 1981 *due to natural attenuation.*[3]

EPA Region 5 is overreaching when it states that the data show a 6-fold decline in fish tissue concentrations due to sediment removal, and EPA apparently compared just two data points, 1981 and 1994, to support its claim. When the entire data set is considered, as we have done here, the data do not support the conclusion that sediment removal at the Shiawassee River – *any more than natural attenuation* – was responsible for reductions in fish tissue concentrations. Moreover, the data provide no basis for any claim regarding the *extent* to which reductions in fish tissue concentrations are attributable to sediment removal.

2.2 – Lake Jarnsjon, Sweden

Lake Jarnsjon is a 62-acre lake located 72 miles upstream of the mouth of the Eman River in Sweden. PCBs were discharged to the lake from a paper mill that had used recycled paper as raw material. In 1991, 12 core samples from the top 40 cm of lake sediment had PCB concentrations ranging from 0.4 mg/kg to 30.7 mg/kg. Sediment, biota, and water column measurements in the late 1980s and early 1990s indicated elevated PCB levels in fish and an average annual loss of 12 to 15 pounds of PCBs from the lake to the downstream river.

[3] A similar conclusion was drawn by MDNR's consultant, Warzyn (1992), who stated that "the 1982 remediation in the reach of the River upstream of Marr Road did not substantially affect the PCB concentration of the edible portion of white suckers." "It appears that the remediation had an effect on PCB concentrations in white suckers near Bowen Road. It was also apparent that the natural spreading of PCBs by sediment transport between 1974 and 1981 substantially decreased the concentration of PCBs in fish from both locations (Marr and Bowen Roads). Without remediation, PCB concentrations were slowly dropping over time in fish at Bowen Road."

Lake Jarnsjon in Sweden during dredging of the enclosed eastern part of the lake. 196,000 cubic yards of sediment were removed in 1993 and 1994. Photo: T. Svahn.

In response to these findings, the entire lake bottom was dredged in 1993-94 to remove PCBs to a target concentration of 0.5 ppm or less (196,000 cubic yards of sediment were removed). Removal depths ranged from 40 cm (1.3 feet) to 160 cm (5.25 feet). Sediment was disposed of in a nearby dedicated landfill. Based on pre- and post-remediation sediment samples, an estimated 97% of the PCBs were removed. Sixty-two post-dredging surface sediment samples collected from across the lake exhibited PCB concentrations ranging from 0.01 mg/kg to 2.4 mg/kg (most were five-part composites collected from depths of 0 to 20 cm).

Table 3 and Figure 3 present summaries of PCB data for several locations on the Eman River, including Lake Jarnsjon. Two years after remediation ended in 1994, average PCB concentrations in Lake Jarnsjon surface water had decreased to 2.7 nanograms per liter (ng/L) in 1996 from 8.6 ng/L in 1991. Similarly, average PCB concentrations in year-old perch from the lake, fish that would have hatched in the summer after remediation, declined from 36 mg/kg lipid in 1991 to 16 mg/kg lipid in 1996, which is apparently the 2-fold reduction claimed by EPA Region 5. However, measurements taken downstream and at upstream reference stations showed that PCB levels in water and fish were already declining throughout the 1990s.

Table 3 - Average PCB Concentrations in Fish and Surface Water from the Eman River, Sweden

Approx. River Kilometer	One-Year-Old Perch (mg/kg lipid)			Surface Water (ng/L)		
	Station	1991	1996	Station	1991	1996
-35	1	1.4	0.9	2	0.7	0.2
-10	3	9.1	6.1	4	1.2	0.9
0 (Lake Jarnsjon)	5	36	16	5	8.6	2.7
+20	--	--	--	6	5.1	2.3
+80	7	6.7	5.2	8	1.3	1.1

Data sources: geometric means reported by Bremle et al. (1995) and Bremle and Larsson (1998).

samples, and no attempt was made by EPA to compare these results with historical results from the same sample stations. The Illinois EPA assessment report does not attempt to draw conclusions as to the meaning of these results or the success or failure of the remedial dredging, nor does it define any follow-up sampling or other actions (Lesnak, 1997).

EPA and Illinois EPA generated a great deal of publicity regarding the declines in Waukegan Harbor fish tissue PCB concentrations and subsequent easing of the fish consumption advisory, attributing these results to the beneficial effects of harbor dredging. However, the basis for such broad claims is unclear. For example, pre-remediation fish data from Waukegan Harbor are extremely limited. One carp composite sample consisting of two fish and one alewife composite sample consisting of five fish were collected and analyzed in 1991 by the EPA. EPA has indicated that the 1991 alewife data (as well as additional carp data from 1983) should not be used to assess temporal trends because of technical problems associated with the data. Consistent with this, EPA Region 5 did not use the alewife data to assess temporal patterns, but did rely on the single carp sample. Post-remediation data include several fish collected in the Upper Harbor (Station QZ001) and in Lake Michigan in the vicinity of Waukegan Harbor (Station QZB02) between 1992 and 1998. We evaluated the data collected through 1998 to explore temporal trends after remediation. Based upon uncertainty associated with the 1991 alewife value, only the carp data were used for analysis of temporal trends.

As shown in Figure 4, total PCB levels in carp declined from 136 mg/kg lipid in 1991 (based on the single carp

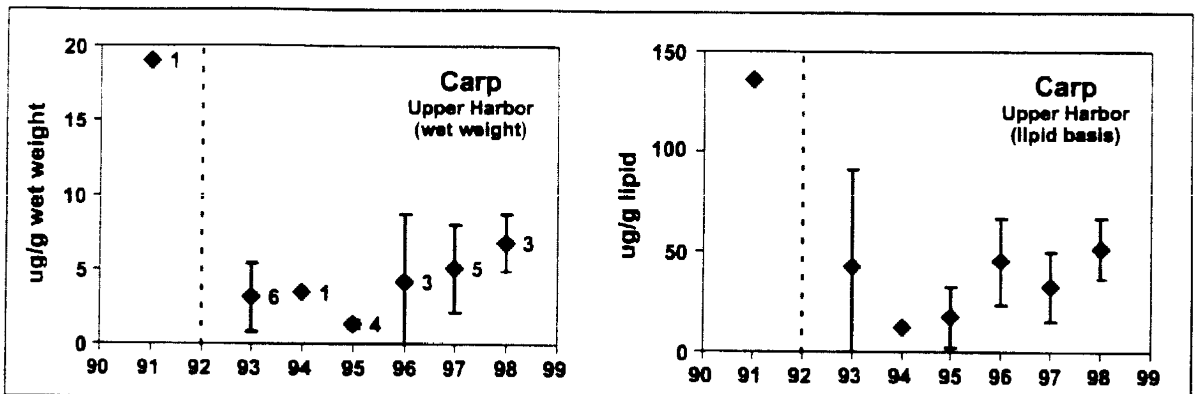


Figure 4 - Average total PCB concentrations in carp collected from the Upper Harbor of Waukegan Harbor. A single carp sample in 1991 apparently forms the basis for EPA characterization of the effects of dredging on fish PCB levels in the Upper Harbor. While these graphs indicate that PCB levels were lower in 1993, the lack of adequate pre-remediation data and the fact that fish tissue concentrations have generally been rising since 1994 indicate the presence of other factors that limit the ability to differentiate the effects of various remedial activities in the harbor. Note that data markers indicate mean values with error bars indicating +/- two standard errors. Numbers next to the mean indicate number of samples.

sample) to an average of 36 mg/kg lipid for the period from 1993 to 1998. Note that the post-dredging data included one value greater than the 1991 value (156 mg/kg lipid, collected in August 1993). The wet-weight-based fillet concentrations showed a similar pattern, namely, an apparent decline from 19 mg/kg to an average of 3.9 mg/kg. These declines apparently form the basis of EPA's claim about a 4-fold decrease in fish tissue concentrations. However, there are several features of these data that raise questions as to EPA Region 5's conclusion that dredging caused these decreases in Waukegan Harbor fish PCB concentrations, including:

- The actual extent of the decline in fish PCB levels is not clear because only one PCB measurement was obtained to establish 1991 pre-dredging levels in carp, and this single value was within the range of the concentrations measured after dredging.

- Isolation of Slip #3 by containment likely contributed significantly to decreased exposure, and therefore decreased fish tissue PCB concentrations. The observed impacts on fish concentrations were undoubtedly influenced by the isolation of Slip #3, the most contaminated part of the harbor, as a containment cell. For example, based on the average sediment PCB concentrations measured in Slip #3 and the other areas of the harbor in 1977-78 and 1985-86, containment and isolation of the slip alone equates to a 65% to 75% reduction in the area-weighted average sediment PCB concentration in the harbor. It is therefore difficult to distinguish between the relative contributions of Slip #3 containment and Upper Harbor dredging, or other factors, in judging the overall declines in fish data.

- The observed decline is inconsistent with the dynamics of the bioaccumulation process. The decline in wet-weight PCB concentration claimed between 1991 and 1993 implies a PCB half-life of approximately nine months within the carp body. We developed a basic bioaccumulation model for carp with weight and lipid fraction similar to those samples in the harbor (approximately 5 kg with a lipid fraction of 13%).[5] This model is considered realistic in that it computes a biota/sediment

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[5] Bioaccumulation models provide a means by which the bioenergetic and toxicokinetic mechanisms controlling PCB uptake and loss rates can be explored in an integrated, quantitative fashion, subject to the constraints of mass balance and the requirement to match contaminant concentrations measured in the field. Metabolism has in general been found to be insignificant in models of total PCB bioaccumulation (Gobas et al., 1995; Morrison et al., 1997; Connolly, 1991; Connolly et al., 1992). Thus, PCB elimination is slow and metabolism is probably not an important loss mechanism. The carp model included elimination across the gill and growth dilution as the two mechanisms causing PCB concentrations to decline in the fish.

For metabolism to be important in the field, the rate must be significant relative to the other known mechanisms by which PCB concentrations are reduced in fish: elimination by diffusion across the gill surface, and growth. The depuration of PCBs by fish subject to chronic exposure is often very slow, much slower than observed in short-term experiments (de Boer et al., 1994; Lieb et al., 1974; O'Connor and Pizza, 1987; Sijm et al., 1992). Half-lives on the order of years have been measured (de Boer et al., 1994).

The lipid fractions reported are apparently for fillets, but this has not been confirmed and fish aging data are not available for this data set. They were used to represent whole-body lipid contents in the model. In general, whole-body lipid (continued...)

accumulation factor of 8 grams of organic carbon per gram of lipid, which is within the range of values measured in, for example, Green Bay and Lake Orono (HydroQual, 1995). The calculated depuration half-life in the model is 6.5 years, as depicted on Figure 5. The predicted decline in fish PCB levels following removal of all exposure sources is much slower than the rate apparent in the empirical data. Thus, the observed rate of decline is not consistent with the principles of toxicokinetics and bioenergetics, meaning either the single 1991 value is inaccurate or non-representative, or that the fish sampled after remediation did not accumulate PCBs from the same exposure sources as the single fish sampled in 1991.

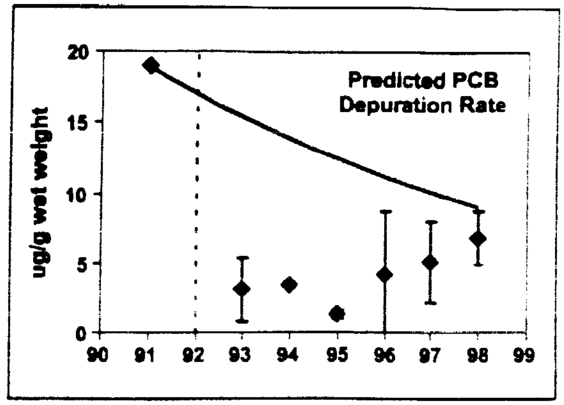

Figure 5 - Average total PCB concentrations in carp collected from the Upper Harbor of Waukegan Harbor. The trend line added to this graph is output from a bioaccumulation/depuration model for carp, assuming all exposure sources have been removed. The predicted half-life for depuration of PCBs is 6.5 years, which is inconsistent with empirical data and indicates that the carp sample in 1991 is not representative and/or the fish sampled after remediation may not have accumulated PCBs from the same sources as the carp sampled in 1991.

- The temporal trends in PCB concentrations in harbor fish are inconsistent with the removal of the local exposure source, meaning other factors must be playing a role in determining fish tissue concentrations. PCB levels in fish are expected to decline monotonically following the removal of the primary exposure source, but as shown in Figures 4 and 5, PCB levels in carp collected in the harbor show an increasing trend. Increases in PCB levels after 1993 were observed in other species as well (e.g., lake trout; see Figure 6). The reasons for the observed increases are not known, but they suggest that there are factors other than containment or harbor dredging controlling PCB levels in the fish of Waukegan Harbor.

It is unlikely that the decline in lake trout PCB levels from 1991 to 1992 was due solely to remediation activities in Waukegan Harbor. First, such a dramatic and rapid decrease could only have occurred if the sediments of Waukegan Harbor provided nearly all of the PCBs to the pelagic food web of the lake trout in Lake Michigan at station QZB02 (outside the harbor). This seems improbable, based on the observation that the lake trout at station QZB02 sampled in the late 1980s and in the mid-1990s appear to have total PCB concentrations that are similar to average levels measured elsewhere in Lake

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(...continued)
contents are greater than fillet values. Increasing the whole-body lipid contents would result in a greater half-life, and therefore would show an even slower depuration rate.

Michigan, on the order of 1 mg/kg to 5 mg/kg wet weight in skin-on fillets (Stow et al., 1995).

In addition, Figure 6 shows that a similar temporary decline was observed in lake trout from station QZB02 in 1984-85. The reasons for the declines in 1984-85 and 1991-92 are not known, but it is likely that effective removal of a major exposure source would result in a permanent decline, not a temporary one. Thus, the observation of a decline in lake trout PCB levels in 1991-92, at the same time as the removal action in Waukegan Harbor, may have been fortuitous. The observation of similar declines and subsequent rises within and outside of the harbor suggest that regional processes not related to the sediments of the harbor may have significant impacts on PCB levels in fish collected within the harbor.[6]

In conclusion, the impacts of dredging on PCB levels in Waukegan Harbor fish cannot be quantified for several reasons, including: 1) the usable pre-dredging fish data are limited to one carp sample (with a PCB

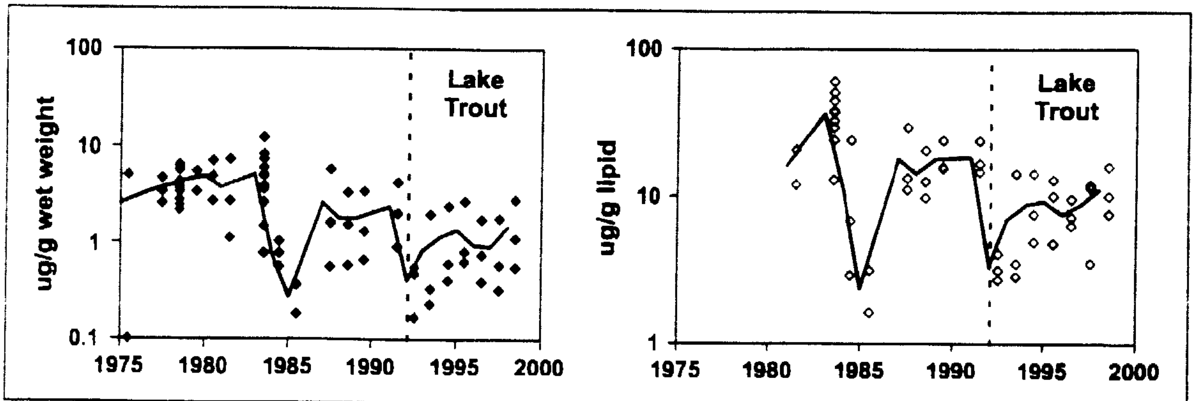


Figure 6 - Total PCB concentrations in lake trout collected from Lake Michigan in the vicinity of Waukegan Harbor (Station QZB02). The data (plotted as symbols) and annualized averages (plotted as lines) indicate a great deal of variability during each sample year and through time. The remediation of the harbor in 1992 cannot account for the declines observed in fish collected near the harbor in 1984-85 and 1991-92, or the recurring increases that are apparent over the past 25 years. The vertical dashed line denotes when remediation occurred.

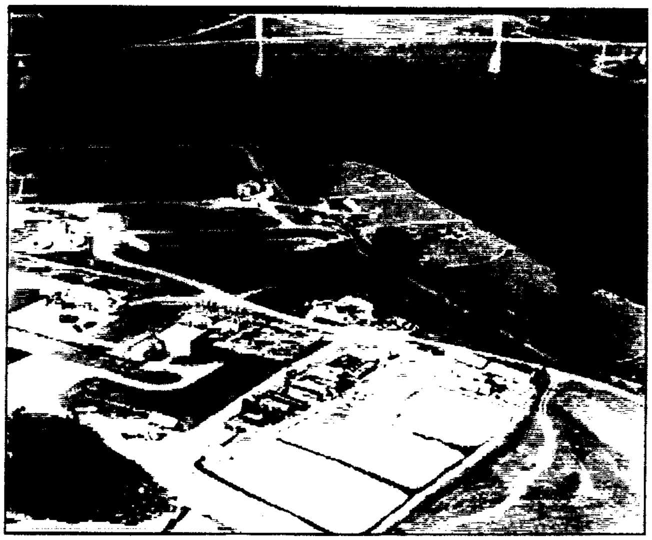
concentration that lies within the range of the post-dredging measurements), 2) the containment and isolation of Slip #3 most likely contributed significantly to the decline in PCB exposure and fish tissue PCB concentrations, 3) the observed rate of decline is much faster than expected based upon predicted rates of fish

[6] For example, one member of the NAS Committee asked Mr. Doody during his presentation about the potential influence of zebra mussels that are now widespread in the Great Lakes basin. Zebra mussels filter large quantities of particles and deposit much of that material on the sediment surface in the form of feces and pseudo-feces. Hydrophobic contaminants associated with those particles are thereby transported from the water column to the sediment bed. This can result in decreased availability of such contaminants to strictly pelagic food webs, or to increased availability to food webs associated with benthic invertebrates. Zebra mussels may be playing a part in recent PCB dynamics in Lake Michigan, but their relationship to the trends observed in the Waukegan Harbor vicinity is not clear.

depuration, and 4) the temporal trends in harbor and Lake Michigan fish do not indicate steady declines in PCB concentrations as would be expected after the removal of a primary local exposure source.

2.4 – St. Lawrence River/GM Massena, New York

In November 1995, along the shore of the St. Lawrence River in northern New York State, 13,300 cubic yards of PCB-containing sediments were removed from an 11-acre nearshore site adjacent to the General Motors facility in Massena, New York. Extensive verification sampling of six dredged sub-areas demonstrated that PCB levels in none of the sub-areas within the removal area met the 1 ppm PCB cleanup level, even after a significant number of repeated passes of the hydraulic dredge. Average surface sediment PCB levels left in the six sub-areas ranged from 3 mg/kg to 27 mg/kg PCBs. The 1.72-acre sub-area having the 27 mg/kg average was subsequently capped.



An 11-acre nearshore area along the St. Lawrence River near Massena in northern New York State was dredged in 1995. 13,300 cubic yards of PCB-containing sediment were removed, and residuals in a 1.7-acre area were capped after dredging operations were complete.

Post-remediation monitoring is being performed in accordance with a St. Lawrence River Monitoring and Maintenance Plan, prepared in 1996 upon completion of remediation (BBLES, 1996). One impediment to implementing the monitoring plan, and thus adding uncertainty to the interpretation of associated data, is the fact that a targeted cove with elevated PCB levels adjacent to the remediated area was not remediated due to property access restrictions (which still exist).

According to the monitoring plan, fish monitoring efforts include annual collections of juvenile spottail shiners, a resident minnow species common to the St. Lawrence River. Data describing whole-body PCB concentrations (and lipid content) in spottails are being used to monitor the effects that sediment remediation activities may have on PCB concentrations in nearby populations of St. Lawrence River aquatic biota. The monitoring objective is to provide a measure of the effectiveness of the dredging and sub-area capping in reducing the bioavailability of sediment-based PCBs to resident aquatic biota of the St. Lawrence River and to provide a baseline for future remedial actions in the cove. Annual sampling efforts include the collection of seven whole-body composite samples from each of two sample locations, the nearshore remediation area and the cove, for a maximum total of 14 samples. Sampling began during the fall of 1997. However, due to access restrictions, spottail shiners still could not be collected from the cove.

Two annual monitoring reports have been issued (BBLES, 1998; 1999), and include spottail shiner wet-weight and lipid-normalized PCB data for the remediation area. According to the two reports, PCB concentrations in spottail shiners collected in 1998 appear slightly higher than those collected in 1997, with an arithmetic mean of seven composite whole-body samples exhibiting 3.6 mg/kg PCBs in 1998 versus 1.2 mg/kg in 1997. However, PCB concentrations remain much lower than data from 1988 and 1989 reported by the Ontario Ministry of Environment (OME) and New York State Department of Environmental Conservation (NYSDEC), but similar to 1990-91 and 1994 data (see Figure 7). Direct comparison of pre-remediation fish data with post-remediation data is complicated by uncertainties about collection locations for the pre-remediation fish.

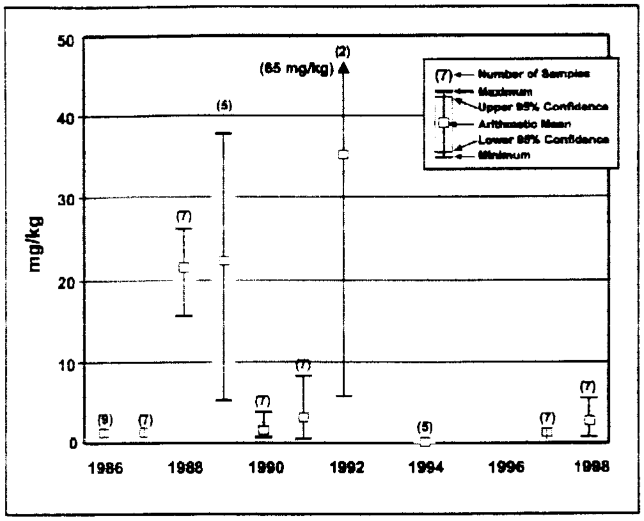


Figure 7 - Total PCB concentrations in spottail shiner whole-body composite samples collected from the GM Massena site on the St. Lawrence River. PCB levels may have decreased since the late 1980s, but the pre-remediation data are limited by factors such as variability (especially the 1988-89 and 1992 data relative to all other years) and the fact that pre-remediation sampling locations cannot be identified in order to make reliable comparisons.

According to BBLES (1999), OME and NYSDEC have indicated that it is not possible to verify the locations where specific pre-remediation fish were collected.

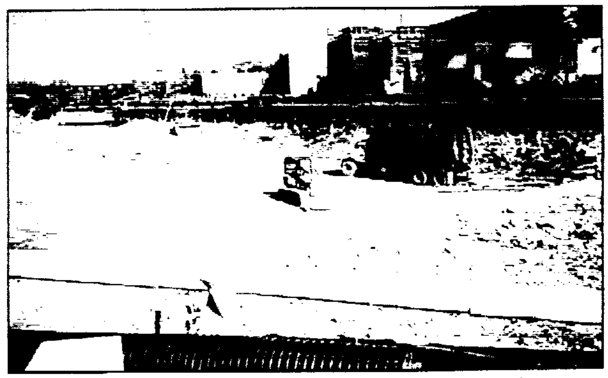
The monitoring reports describe an anomaly to the apparent general downward trend since the late 1980s: two spottail shiner samples collected by NYSDEC in 1992. The wide difference in concentrations for these two samples (total PCB concentrations of 5.7 mg/kg and 65 mg/kg) is difficult to explain. Similar variability, although not as great, is also evident in the data collected by the OME in 1989. The variability of the data may be due to several factors, including differences in sampling locations, fish lengths and sizes, fish lipid content, or species mobility. Regardless, the variability of the data precludes a more detailed evaluation and interpretation of the overall spottail shiner data. As such, the monitoring reports conclude that the significance of the 1997 and 1998 PCB data, and any apparent trends, will need to be more thoroughly evaluated following the collection of additional data over the next three years.

We have been unable to reconstruct how EPA Region 5 has used the St. Lawrence River data to calculate an

8-fold reduction in post-remediation fish concentrations, especially when fish data for five of the eight pre-remediation sampling events show PCB concentrations at levels similar to post-remediation levels. Although fish levels may seem to be on a downward trend, the question of how and where the pre-remediation fish were exposed (i.e., within the 11-acre site, the cove, or the very large St. Lawrence River channel?) precludes a complete and direct comparison, and therefore limits the certainty of any associated conclusions. Clearly, the need for post-dredging capping of a portion of the removal area also makes it difficult to differentiate the effects of dredging versus these other factors.

2.5 – Ruck Pond, Wisconsin

Ruck Pond is one of a series of mill ponds created on Cedar Creek, just upstream of the low-head Ruck Pond Dam in the town of Cedarburg, Wisconsin, north of Milwaukee. In 1994, an impounded 1,000-foot section of the creek (Ruck Pond) was drained after a temporary dam was installed on the upstream end and flow was bypassed through siphon piping. The project goal was to remove all soft sediment (contaminated with PCBs) down to bedrock, to the extent practicable. The 60 soft-sediment samples that were collected from depths of 6 to 24 inches just before remediation exhibited PCB concentrations ranging from non-detectable to 2,500 mg/kg (average 76 mg/kg).



Ruck Pond on Cedar Creek in Wisconsin was remediated in 1994 using dry excavation techniques after the stream flow was diverted and the pond drained. 7,730 cubic yards of sediment were removed.

A total volume of 7,730 cubic yards of sediment was removed by dry excavation in 1994 and disposed of at commercial landfills. Despite intensive and painstaking removal efforts over a five-month period, some residual sediment was left on the creek bed. Seven samples of the residual sediment exhibited PCB concentrations ranging from 8.3 mg/kg to 280 mg/kg (average 84 mg/kg). As part of pond restoration efforts, clean materials used for access to the pond were spread along portions of the pond bottom. Although not intended for capping, these materials inevitably provided some containment of the residual sediment, and likely would have reduced (via burial) the relatively high PCB concentrations remaining at the sediment surface that the dredge equipment could not effectively remove.

The Wisconsin Department of Natural Resources (WDNR) measured whole-body PCB congener concentrations in caged fathead minnows at three locations before and after the sediment removal operation (Amrhein, 1997. Three cages were placed at each of three stations: a site in Cedar Creek upstream of Ruck Pond called Cedarburg Pond, a site within the downstream end of Ruck Pond, and a site downstream of the Ruck Pond Dam, located just upstream of Columbia Dam.

In July 1994, just before the start of removal, PCBs were measured in caged fathead minnows at the three stations. The average PCB concentrations were 0.12 mg/kg upstream, 24 mg/kg at the Ruck Pond station, and 12 mg/kg at the downstream station (7.1, 1,700, and 630 mg/kg lipid, respectively). The average PCB concentrations measured in caged fish in August and September 1995, about one year after remediation, were 0.09 mg/kg upstream, 4.2 mg/kg within the pond, and 11 mg/kg downstream (2.2, 170, and 360 mg/kg lipid, respectively). These PCB levels in the caged fish collected in Ruck Pond appear to have declined 75 to 85%[7] on a wet-weight basis and approximately 90% on a lipid basis after remediation. It is apparently on this basis that EPA Region 5 concluded that sediment removal in Ruck Pond resulted in an 9-fold reduction in fish PCB concentrations. However, caged fish PCB concentrations at the upstream "background" location also declined 25% wet weight and 70% on a lipid basis one year after remediation, and caged fish concentrations downstream of Ruck Pond declined 10% wet weight and 40% on a lipid basis. These declines outside of Ruck Pond indicate that system-wide natural recovery processes may be occurring.

Two years later, samples of resident fish were collected in 1997 by the WDNR and analyzed for PCBs. Fish were collected from two stations: within Ruck Pond and a downstream location. Average total PCB concentrations measured in fillets of four species of resident fish still exceeded the U.S. Food and Drug Administration (FDA) 2 mg/kg tolerance level and ranged from 0.35 mg/kg to 3.1 mg/kg at the station within Ruck Pond, and 1.7 mg/kg to 13.8 mg/kg at the station downstream of Ruck Pond. Fish species included carp, pike, rock bass, and white sucker. We are attempting to obtain lipid values and additional pre-remediation fish data in order to develop a full temporal and spatial comparison.

The reasons for the differences in fish tissue concentrations between the upstream and downstream stations and the Ruck Pond station are unclear. James Amrhein (1997) of the WDNR has indicated that the smaller decline at the Columbia Dam station may be an artifact of cage location. It is also possible that the PCB levels measured at the most downstream station are a more realistic reflection of post-remediation exposure levels than the Ruck Pond station. However, difficulties in implementing the caged fish program may have been a factor.

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[7] Two exposure periods occurred in Ruck Pond, 29 and 37 days. Average PCB levels were greater in the longer exposure, indicating that the fish were not at steady state with respect to their exposure sources. Therefore, pre-and post-remediation comparisons were carried out independently for each exposure period. The range of values given reflects the two comparisons.

For example:

- Pre-remediation cages in Ruck Pond were deployed during the time that pre-removal in-water construction preparations and disturbances were occurring (e.g., work boat traffic, installation of the dam and siphon).

- One of the pre-remediation cages in Ruck Pond was lost; two others were displaced about 100 feet and were not found for removal until 29 and 37 days after placement (rather than the targeted 28 days).

- Pre- and post-exposure periods were in different months (June vs. August) with different water temperatures likely.

In conclusion, the great majority of soft sediment was removed from Ruck Pond; however, elevated PCB levels up to 280 mg/kg remained in residual sediment after remediation. PCB levels in caged fish placed in Ruck Pond one year after remediation exhibited significant declines compared with pre-remediation caged fish. However, at the same time, upstream (background) and downstream caged fish also exhibited substantial declines. The presence of residual PCBs, the disturbance of the pre-remediation cages, and the observation of a decline in fish levels upstream of Ruck Pond, all add considerable uncertainty to EPA's conclusions and attempts to isolate and quantify the effectiveness of dry excavation sediment removal on fish PCB levels. In addition, the pond restoration materials provided some containment of the residual PCBs, thereby further limiting the ability to demonstrate the effectiveness of sediment removal versus other factors.

2.6 – Summary of Case Study Evaluation

The impacts of sediment removal by excavation or dredging are influenced by several site-specific factors, including the presence of pre-existing system-wide natural recovery processes, the potential for resuspension of sediments during remediation, the presence of residual PCBs that can recontaminate the sediment surface after remediation, and modification or destruction of fish habitat as a result of remedial action. Thus, the impacts of sediment removal are likely to vary among sites, and a robust understanding of these impacts should be based on adequate data from many sites. Therefore, the analysis of results from several sediment remediation projects is relevant and critical. The focus on fish tissue PCB concentrations also is reasonable, since risk reduction should be the focus of all remedial activities, and fish ingestion is typically a primary exposure pathway driving both ecological and human health risks.

However, because EPA has not addressed or accounted for each of these factors in its analyses of the five case study projects (or any of the 12 projects cited overall). EPA cannot support its conclusions regarding the impacts of sediment removal actions on declines in fish tissue PCB levels. This is because the effects of sediment removal at such sites cannot be separated from other recovery processes or remedial actions, including natural attenuation, source control, or containment. At all five sites there is evidence of system-wide changes in biota PCB levels and other factors that make it very difficult to demonstrate sediment removal as the only factor that has led to declines in fish tissue concentrations.

Collection of several years of high-quality and comparable data before and after remediation is critically important to developing a technically sound assessment of the effectiveness of sediment removal in reducing PCB levels in fish, and the associated reductions in PCB bioavailability, exposure, and risk. An adequate sampling program, database, and evaluation methodology should include the ability to: 1) distinguish removal impacts from the effects of other processes such as the natural attenuation, transport, or containment of PCBs, 2) reduce the uncertainties inherent in field sampling of biota, and 3) account for the long biological half-lives of strongly hydrophobic chemicals such as PCBs that can delay the response of fish tissue levels to changes in their degree of exposure. These important pre-condition data are simply not in place for the sediment remediation projects cited by EPA. At the Waukegan Harbor site, for instance, the pre-remediation fish tissue data consisted of one PCB measurement and, at the Ruck Pond site, the pre-remediation study included fish cages that were disturbed and one that was lost completely. The uncertainties associated with these types of monitoring datasets limit their utility for quantifying and therefore demonstrating the impacts of dredging on fish contaminant levels.

The mixed results observed for all five of the case study projects cited by EPA indicate that an emphasis on mass removal efficiency alone as an objective for management of contaminated sediment cannot be relied upon as a measure of the effectiveness of sediment removal in reducing contaminant bioavailability and exposure, and therefore potential risks associated with residual contaminant levels in post-remediation sediments and fish. Evaluations of risk reduction, when based on adequate data and methodology, represent a more technically sound measure of remedial effectiveness than removal efficiency. Thus far, the pre- and post-remediation monitoring programs and EPA's subsequent data analyses have not achieved these basic requirements in order to substantiate its numerous claims regarding the effectiveness of sediment removal.

SECTION 3 – EVALUATION OF OTHER EPA REGION 5 CLAIMS

This section critiques EPA Region 5's three other major assertions regarding the effectiveness of sediment removal, based on the 12 projects cited by EPA (listed in Table 1). These other assertions are:

- Contaminant mass removal is the primary measure of remedial success;
- Short-term adverse effects of dredging are minor; and
- Unit costs tend to decrease with the increasing scale of sediment removal.

3.1 – EPA Claim Regarding Mass Removal as a Measure of Dredging Success

A remedy designed solely to remove a large percentage of the contaminant mass may not lead to reductions in exposure and risk because risk in aquatic systems is driven by the *position* of contaminant mass, not just the *presence* of that mass. This means that contaminants in the biologically active zone of surficial sediments are potentially available for exposure to the benthic and pelagic food webs, but contaminants positioned well below the sediment surface (i.e., buried) do not pose risks because they are not available to various receptors. Nevertheless, in its evaluations EPA Region 5 judged remedial success based on the amount of mass removed without regard to where in the sediment profile the mass was located, whether stated concentration-based cleanup goals were achieved, or whether exposure potential and risk were reduced.

Regarding attainment of stated cleanup goals, EPA Region 5 has not demonstrated that low sediment cleanup levels have been achieved throughout the remedial target area at any of the eight dredging projects cited by Region 5. For one project, the cleanup level was not attainable in any sector of the target area (St. Lawrence River/GM Massena). At three sites, cleanup levels were not achieved in several areas targeted (River Raisin/Ford Outfall, Manistique Harbor, and Lake Jarnsjon). For three projects, the residual contaminant level is unknown because verification sampling and analyses were not performed (Shiawassee River, Waukegan Harbor, and Black River). For one project, no sediment target was set, but PCB levels as high as 295 mg/kg remained after dredging (Sheboygan River).

Six of the 12 projects cited in Table 1 were used by Region 5 to claim that 98% or more PCB mass removal was achieved. However, four were relatively small-scale hot spot removal projects (River Raisin/Ford Outfall, St. Lawrence River/GM Massena, Ottawa River, and Sheboygan River), and two were projects involving removal across the entire bottom of three ponds and a lake (Willow Run Creek and Lake Jarnsjon, respectively). Even if EPA's mass removal claims were relevant to risk reduction, the claim of an average PCB mass removal of 98% or greater is misleading from at least two other standpoints, namely:

- EPA's mass removal calculations are confined only to the targeted area. In the case of hot spot removal projects, there is no recognition that PCB mass present in the water body outside of the targeted area may be considerable and equally as bioavailable as the PCB mass in the targeted area. For example, accounting for the presence of PCB mass in an extended river or stream outside of the target area would add greatly to the pre-dredging mass value and would typically make the calculated percentage of mass removal from a hot spot a much lower and less impressive value.

- Calculating mass removal strictly from a hot spot produces high removal percentages that appear to make dredging highly efficient. For rivers, streams, or other water bodies with diffuse and widespread contamination, and few or no targetable hot spots (e.g., the Fox River), the ability to remove a high percentage of overall PCB mass with a small dredging project may not exist.

Claiming "success" through PCB mass removal calculations ignores the actual project goals and objectives set out in decision documents before the remediation. For example, in Table 4 we have summarized the primary goals, the sediment remedial target, and the outcome for the eight largest projects evaluated by EPA Region 5, including some of the projects mentioned above.[8] Mass removal is not a stated objective of the remediation effort in any of the eight projects, and achievement of the primary goal or significant risk reduction has not been confirmed for any of these projects.

In summary, contaminant mass removal is an easily defined and calculated result that, at face value, may seem sensible and beneficial. However, mass removal may produce little observable long-term benefit or risk reduction, may result in more harm to the environment than benefit, and as a result, may be an inefficient and even counter-productive method to reduce risk from exposure to contaminated sediments.

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[8] The four smallest projects (less than 10,000 cubic yards removed) were omitted from Table 4 because of their small size and interim or pilot status. Further, the smallest of the four projects (Shiawassee River, removal of 1,805 cubic yards) was implemented 17 years ago, before the site was listed on the National Priorities List and at a time when such projects were less likely to be approached with scientific rigor. Nonetheless, for the two (of these four) small projects cited by EPA Region 5 as attaining 98% mass removal (Ottawa River unnamed tributary and Sheboygan River pilot project), mass removal was not set out as an objective. For the unnamed tributary, the objectives were to reduce the potential for PCB movement and to minimize the potential for human and wildlife exposure. For the Sheboygan River pilot project, the objectives were to test dredging and armoring technologies and to remove sediments with greater than 686 mg/kg PCBs, based on dermal exposure risk (AEM, 1999).

Table 4 - Primary Goal versus Outcome for the Eight Largest Sediment Remediation Projects Cited by EPA Region 5

Primary Goal	Basis for Goal	Cleanup Goal	Achievement of Cleanup Goal	Achievement of Primary Goal
Willow Run Creek, Michigan - 450,000 cubic yards removed by dry excavation				
Eliminate adverse ecological impacts	Ecological assessment based on ingestion modeling, then feasibility and compliance with MI Act 307	Depending on locale, removal to 21 or 1 ppm PCBs below waterline and 21 or 2.3 ppm above waterline	Achieved; based on verification sampling	Unknown; no formal post-remediation monitoring program is planned
Lake Jarnsjon, Sweden - 196,000 cubic yards removed by dredging				
Substantially reduce the transport of PCBs from lake sediments to lake water and downstream system in order to reduce PCB concentrations in biota	Analysis of sediment, water, and biota data collected during late 1980s and early 1990s	Maximum 0.5 ppm PCBs and no more than 25% of the remediated area greater than 0.2 ppm	PCBs in 8 shallow (undefined) surface samples from east end of lake after remediation ranged from 0.7 to 2.4 ppm; PCBs in 54 composite samples from entire lake bed (0-20 cm depth) ranged from 0.01 to 0.85 ppm.	Apparently achieved; PCB levels in water and year-old perch had decreased 2 years after remediation, but PCB levels in water and fish from upstream and downstream reference locations also decreased
Bryant Mill Pond, Michigan (tributary to Kalamazoo River) - 165,000 cubic yards removed by dry excavation				
Time Critical Removal Action to mitigate direct contact exposure and threat to aquatic life/wildlife from ongoing releases	Ecological risk assessment and observation of continuing releases from erosion and sloughing from banks	10 ppm PCBs	Reportedly achieved based on verification sampling, but sampling avoided the top 3 inches of sediment/soil where PCBs could remain bioavailable; no justification of this verification sampling technique given	Reportedly achieved, but may be unknown based on verification sampling that avoided surface materials; Action Memorandum stated "the nature of the removal is, however, expected to minimize the need for post removal site control, at least in the Bryant Mill Pond area"

Primary Goal	Basis for Goal	Cleanup Goal	Achievement of Cleanup Goal	Achievement of Primary Goal
Manistique River and Harbor, Michigan - 72,000 cubic yards removed by dredging				
Reduce PCB levels in fish to reduce cancer and non-cancer risks to <10-4 and <1 H.I.	Human Health Risk Assessment; risk targets exclude high-end exposure for subsistence and certain recreators	10 ppm PCBs, which was default level based on BSAF to estimate target, then increased to 10 ppm	In progress. 10 ppm level proving difficult to achieve; PCBs up to 3,000 ppm in residual sediment (Dredge Area 9) were left behind over winter after the 1998 construction season	Dredging continues in 1999, so too early to determine after 5 years of dredging; no post-remediation monitoring program yet defined
Black River, Ohio - 60,000 cubic yards removed by dredging				
Remove all PAH and metal contaminated sediments	Clean Air Act Consent Decree	Depth horizon (removal down to "hard bottom" or bedrock)	Depth horizon achieved, but no analytical verification	Depth horizon achieved, but no analytical verification
Waukegan Harbor, Illinois - 38,300 cubic yards removed by dredging				
Eliminate PCB flux from the harbor into Lake Michigan	Hydrodynamic modeling	50 ppm PCBs in the harbor; 500 ppm PCBs in Slip #3	Unknown; no analytical verification; dredging advanced to a pre-defined depth (reportedly to the underlying uncontaminated sand layer)	Unknown; limited analysis of surface samples from the harbor over 4 years after dredging showed PCBs from 3 to 9 ppm
River Raisin (Ford Outfall), Michigan - 28,500 cubic yards removed by dredging				
Reduce PCB levels in fish	Risk analysis by EPA	10 ppm PCBs (after removal down to native clay layer)	Partially achieved; removal to refusal achieved; 3 verification samples had 12-20 ppm PCBs, 4 had 0.5-7 ppm, 7 had insufficient media	Unknown; no formal post-remediation program, but 2 sediment cores had 60-110 ppm PCBs; MDEQ fish data not available
St. Lawrence River (GM Massena), New York - 13,300 cubic yards removed by dredging				
Reduce PCB levels in fish	Human Health Risk Assessment	1 ppm PCBs	Not achieved; average residual PCBs in 6 quadrants ranged from 3-27 ppm with a maximum concentration of 90 ppm	Two annual post-remediation fish monitoring events complete; no discernible trends between years

3.2 – EPA Claim Regarding the Short-Term Impacts of Dredging

EPA Region 5 makes the unfounded claim that PCB losses during dredging are much less than the annual PCB losses from natural erosion. As discussed below, this claim is illogic because it is based on an inappropriate comparison (i.e., comparing losses from discrete removal areas to losses from entire systems) and ignores the fact that PCB mass is not directly related to risk reduction. Even if one were to ignore these flaws, EPA does not present data to support its conclusion

First, comparing average annual erosional losses from an entire contaminated sediment site to losses from the surface area of a *particular* dredging removal area makes no sense because it is an "apples to oranges" comparison. For example, the Deposit N dredging project on the Fox River in Wisconsin, which is targeting just 13,000 cubic yards of sediment (out of the estimated 11 million cubic yards of contaminated sediment in the lower 39 miles of that river), will likely result in losses to the water column that are much less than annual erosional losses from the entire 39 miles of the river. However, this comparison says nothing whatsoever about what the losses to the water column might be if one were to dredge all (or a significant part of) 11 million cubic yards of contaminated sediments. Thus, it is misleading to compare the mass of PCB transport resulting from annual erosional losses with the mass of PCB lost to the water column from dredging.

Second, as noted previously, the mass of PCBs transported by erosional (or other) events is not as important to risk reduction as the presence and concentration of PCBs in the biologically active zone of surficial sediments. For example, PCB discharges to the Fox River were virtually eliminated in the 1970s, which has allowed over two decades of natural recovery to bury these historical PCB deposits under progressively cleaner layers of fresh sediment from the watershed. This has led to conditions today where surface sediments have low PCB concentrations (most average about 2 mg/kg, which is already lower than EPA cleanup goals at many other sites), and over 85% of PCB mass is buried below one foot or more of cleaner sediment in very depositional areas that are not susceptible to scour at that depth. Therefore, if erosion results in transport and redeposition of these relatively clean surficial sediments, the sediment surface will not become more contaminated over time. Instead, transported sediments mix with clean solids coming in from the watershed so that the mixture that is redeposited will be progressively cleaner over time. The net effect is that PCBs in the surface bioavailable zone will become less available for exposure or transport. On the other hand, if the sediments that are mobilized by dredging come from the more contaminated deep sediment layers, the material transported downstream may, upon redeposition, cause increased exposure because the surficial layer has become more contaminated than pre-dredging conditions.

Third, even if one were to ignore the facts that comparing annual erosional losses from an entire contaminated sediment area with losses from a particular dredging project is irrelevant, and that any such comparisons on the basis of mass are misleading, the data that EPA Region 5 cite do not support EPA conclusions. Region 5 used two sites for its comparisons of annual erosional losses to dredging project losses – Manistique River/Harbor and the Fox River.

In the case of the Manistique River and Harbor, EPA used analyses of PCBs in the water column downstream of the silt-curtained dredging areas, then calculated the equivalent PCB load and compared this loading with a prorated (and previously calculated) annual PCB discharge from natural erosion. Since the surface water concentrations measured during dredging were often low or not detectable, the results at first glance appear quite favorable (however, note that although water-column PCB concentrations were low, levels were still higher than pre-dredging values). In the Fox River case, EPA compared previously calculated annual PCB discharges from natural erosion in the river with the estimated loss from a hypothetical sediment dredging project. The estimated loss was set at 2% of the removed sediment mass, an unverified resuspension loss rate from hydraulic dredges based on "engineering judgment." Again, the comparison appears at first glance favorable – PCB losses during hydraulic dredging for a hypothetical Fox River project are predicted as a factor of 2.5 less than those from annual erosion. However, these comparisons need to be evaluated in light of the following points regarding resuspension losses:

- The idea for this type of a sediment resuspension analysis likely originates with the Interagency Review Team Report for the Manistique River (April 1995) in which the team concluded that: 1) "The adverse effects of implementing dredging (the additional 900 pounds of PCBs released to the harbor) are equivalent to 9 years of PCB loading at the current rate; the review team considered this an acceptable tradeoff . . ." and 2) "Even at a 2% release rate, a 280 pound PCB loss during dredging is only equivalent to a 2 to 3 year loss of PCB under existing conditions." This finding is flawed from several standpoints, namely, it is hypothetical, the loss rates and resuspension rates are unsubstantiated, and the above "adverse effects of implementing dredging" assumed two years of dredging and not the actual five or more years of dredging being implemented at the Manistique site.

- Sediment resuspension is a complicated issue and is influenced by numerous variables. We have determined that data collected to date from *all* small- and full-scale dredging projects are sparse and not sufficient for quantifying resuspension rates. Other important unresolved issues regarding resuspension include the fact that: 1) a portion of the resuspended contaminants falls back onto the dredged surface, making attainment of a low cleanup level extremely difficult, particularly if deep sediments containing higher levels of contaminants are resuspended and redeposited on the surface, and 2) "resuspension plumes" tend to stay close to the bottom as they move away from the dredge, in which case, downstream *surface* water samples may not detect the bulk of resuspended material.

- For multi-year projects with winter shutdowns, the resuspended material that settles onto, and is left on, the surface tends to be loose and unconsolidated and more susceptible to mobilization and downstream transport for months between construction seasons. For example, so-called "short-term" impacts at Manistique Harbor include EPA's leaving sediment PCB concentrations of up to 3,000 mg/kg over the five winter months between construction seasons, as happened at the end of the 1998 season. After years of these "short-term" impacts, they begin to evolve into long-term concerns and opportunities for increased exposure and downstream transport. In short, even though the mass of resuspended material might be relatively small in absolute terms, it may contribute significantly to the risk associated with biological uptake.

3.3 – EPA Claim Regarding Dredging Unit Costs and Economies of Scale

EPA Region 5 concludes that unit costs for sediment remediation decrease as removed sediment volume increases and that very large removal projects will yield much lower unit costs than have been realized on sites to date. This conclusion is not consistent with what is known about the primary determinants of dredging project costs, and is not supported by the cost figures for the projects highlighted by EPA.

The two primary determinants of cost for remedial dredging projects are dredge production rate and disposal cost. Dredge production rate depends on unique site conditions such as access, water depth, and debris; the targeted depth or cleanup level; limitations in land-based water management facilities; and whether verification sampling is performed during dredging. Disposal cost depends on type of contaminant, type of disposal facility (on-site, dedicated nearby, or commercial), and distance of the disposal facility from the site. To a large extent, these variables are not volume-dependent. Economy-of-scale advantages, such as longer use of temporary support facilities and water treatment facilities and possible slightly lower unit disposal costs for large volumes, are small in comparison. As a result, large projects will still be extremely costly.

In an article by EPA Region 5 titled "Dredging: Long-Term Benefits Outweigh Short-Term Impacts" (Pastor, 1999), EPA states that, "Although removing greater volumes increases total costs, economies of scale on larger projects also give you lower unit costs. In other words, as projects increase in size, the cost of removal and treatment and/or disposal per cubic yard of contaminated sediment goes down." To evaluate EPA's claim, we compared total unit cost versus volume of sediment removed for 40 completed projects in the United States:

20 remedial dredging projects and 20 dry excavation projects.[9] Although the smallest projects (e.g., pilot-scale removals and others less than 10,000 cubic yards) tended to have high unit costs, no clear trends in economy of scale were discernible as unit costs ranged widely from about $50 to $1,500 per cubic yard with no apparent relationship to sediment volume removed. Therefore, it is unclear how and on what basis EPA arrived at its definitive claim regarding the existence of economies of scale.

[9] This evaluation is not necessarily a definitive test of EPA's claim because no "very large" removal project has been implemented, and the projects represent a wide variety of site conditions, remedial goals, and disposal methods that are not necessarily directly comparable. Nonetheless, site data were evaluated for apparent trends in economy of scale.

SECTION 4 – SUMMARY OF OVERALL EVALUATION

The purpose of this paper was to review how EPA Region 5 reached its stated conclusions regarding the effectiveness of sediment removal based on the data from the 12 sites listed in Table 1, and to present our own findings and supporting rationale. Our primary conclusions include: 1) EPA has not demonstrated that the sediment removal actions at the 12 cited projects reduced PCB exposure and risk, 2) reduction of PCB concentrations in fish is a meaningful measure of risk reduction, but the uncertainty associated with limited data availability, data quality concerns, and EPA's selective use of data do not support EPA's conclusions regarding the effects of sediment removal on fish at these sites, and 3) EPA's analysis of the 12 sites cannot differentiate the effectiveness of sediment removal from that of several other factors such as source control, containment, capping, or natural attenuation. We also note:

- In many instances, the factual basis for EPA's claims and conclusions is not apparent. References are not cited and backup data are not provided. Further, the available data are used selectively by EPA, and the impacts of mechanisms other than sediment removal are not adequately recognized or accounted for in EPA analyses.

- EPA neither defines the original remediation goal for each project nor fully reports results relative to whether risks were reduced and other remedial goals were achieved. Instead, EPA measures "success" by the degree of mass removal or concentration reduction without regard to risk-based benefits to be achieved. Even on projects with high contaminant mass removal efficiency, residual surface sediment concentrations in the remediated area often exceed stated cleanup goals and remain available for transport or uptake into food webs, which does not serve to reduce risk.

- Contaminant mass removal is an easily defined and calculated result that, at face value, may seem sensible and beneficial. However, mass removal may in fact produce little observable long-term benefit or risk reduction, may result in an overall net harm to valuable habitat and the environment and, as a result, may be an inefficient and even counter-productive expenditure of dollars and resources.

- EPA's data collection and analysis methods for the 12 projects are flawed. In most cases the pre-remediation fish data are sparse, and monitoring was not planned or documented with the foresight or intent of comparison with post-removal data, making EPA's stated conclusions difficult to support. Our detailed review (in Section 2) of the five case study projects evaluated by EPA demonstrates how the limitations in Region 5's data and methodology make it difficult to determine what, if any, beneficial or other effects on fish can be attributed to sediment removal rather than other observed factors such as natural attenuation.

- EPA's claim that contaminant losses due to sediment resuspension during dredging are temporary and produce only minor short-term impacts is suspect. The claim ignores that fact that contaminant mass, whether in-situ or transported, is not directly related to risk reduction. Rather, contaminated sediment resuspension and redeposition caused by dredging can lead to unacceptable increases in risk as contaminants are made available for transport or biological exposure.

- EPA cannot substantiate its claim that unit costs for sediment remediation decrease as volume of sediment removed increases. In contrast, we have concluded from evaluations of actual cost data that the two primary determinants of cost for remedial dredging projects are dredge production rate and disposal cost, neither of which is very volume-dependent.

- Finally, removal of sediment by dredging or dry excavation is not a cure-all for managing contaminated sediment. On future projects, it is recommended that EPA:
  - Seriously consider the limitations and potential negative impacts associated with sediment removal as a remedy, including an evaluation of overall environmental and social costs and benefits;
  - Not ascribe benefits to sediment removal based on limited or inappropriate data;
  - Provide for sufficient pre-and post-remediation data and analysis to demonstrate benefit. The approach used by EPA for justifying sediment removal at the 12 project sites evaluated here is inconclusive and not technically sound; and
  - Not pursue large dredging projects until the risk-reduction benefits of sediment removal have been adequately demonstrated.

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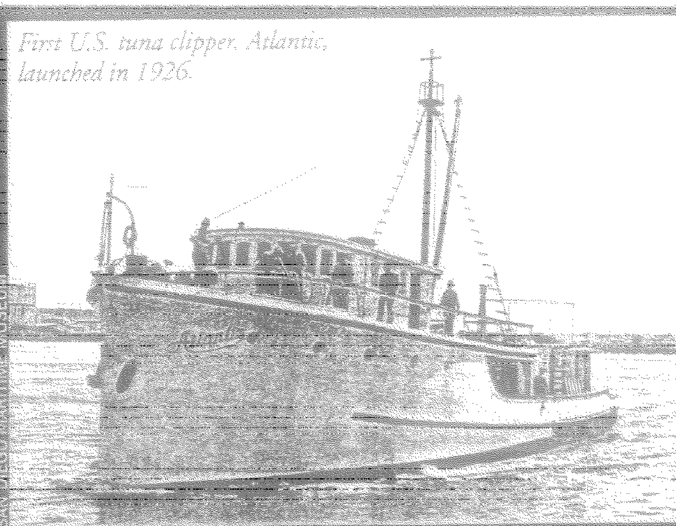


First U.S. tuna clipper, Atlantic, launched in 1926.

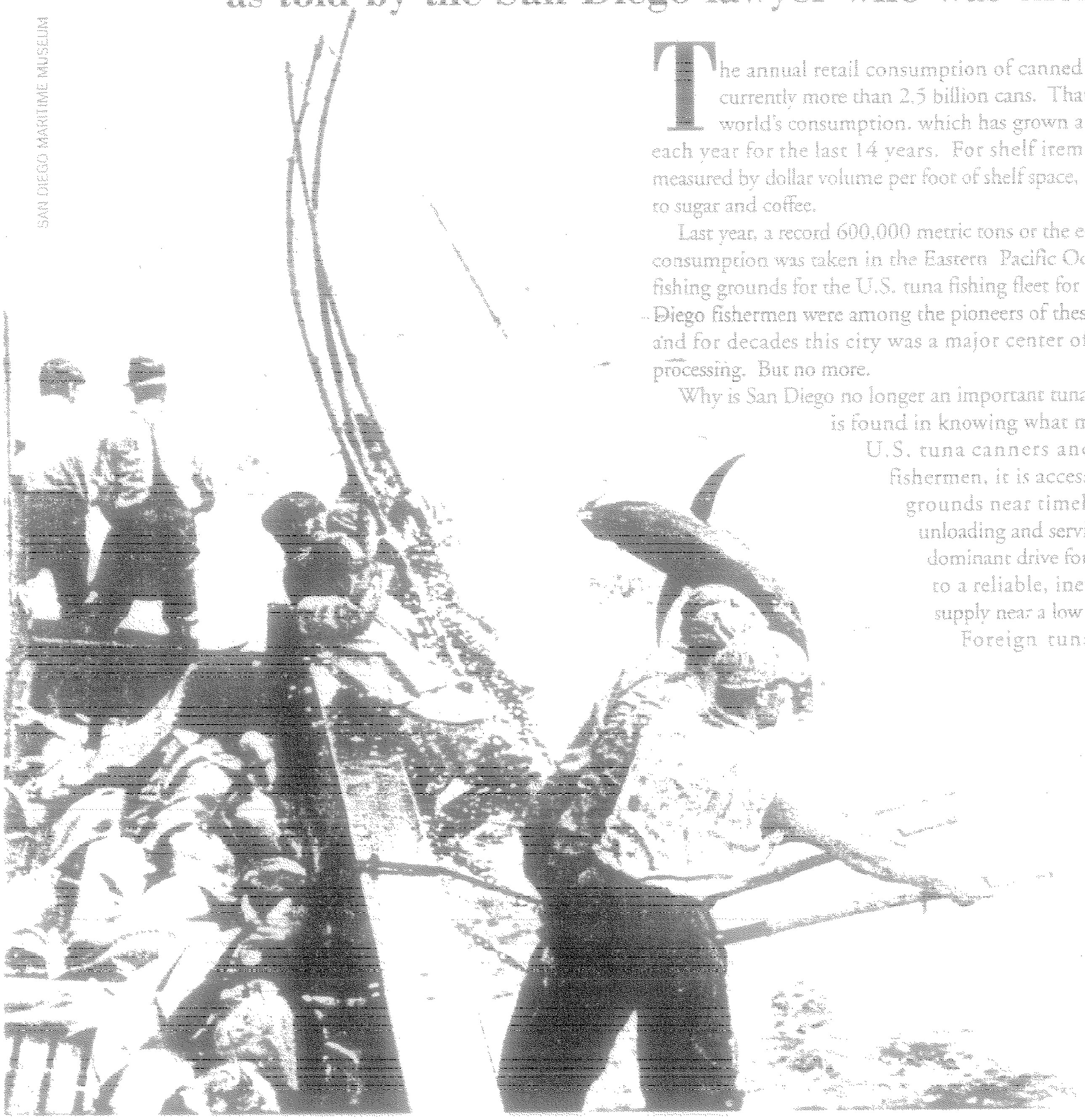
SAN DIEGO MARITIME MUSEUM

The Last Boat From TUNAVILLE

by August Felando

A History of San Diego's Tuna Industry

as told by the San Diego lawyer who was there

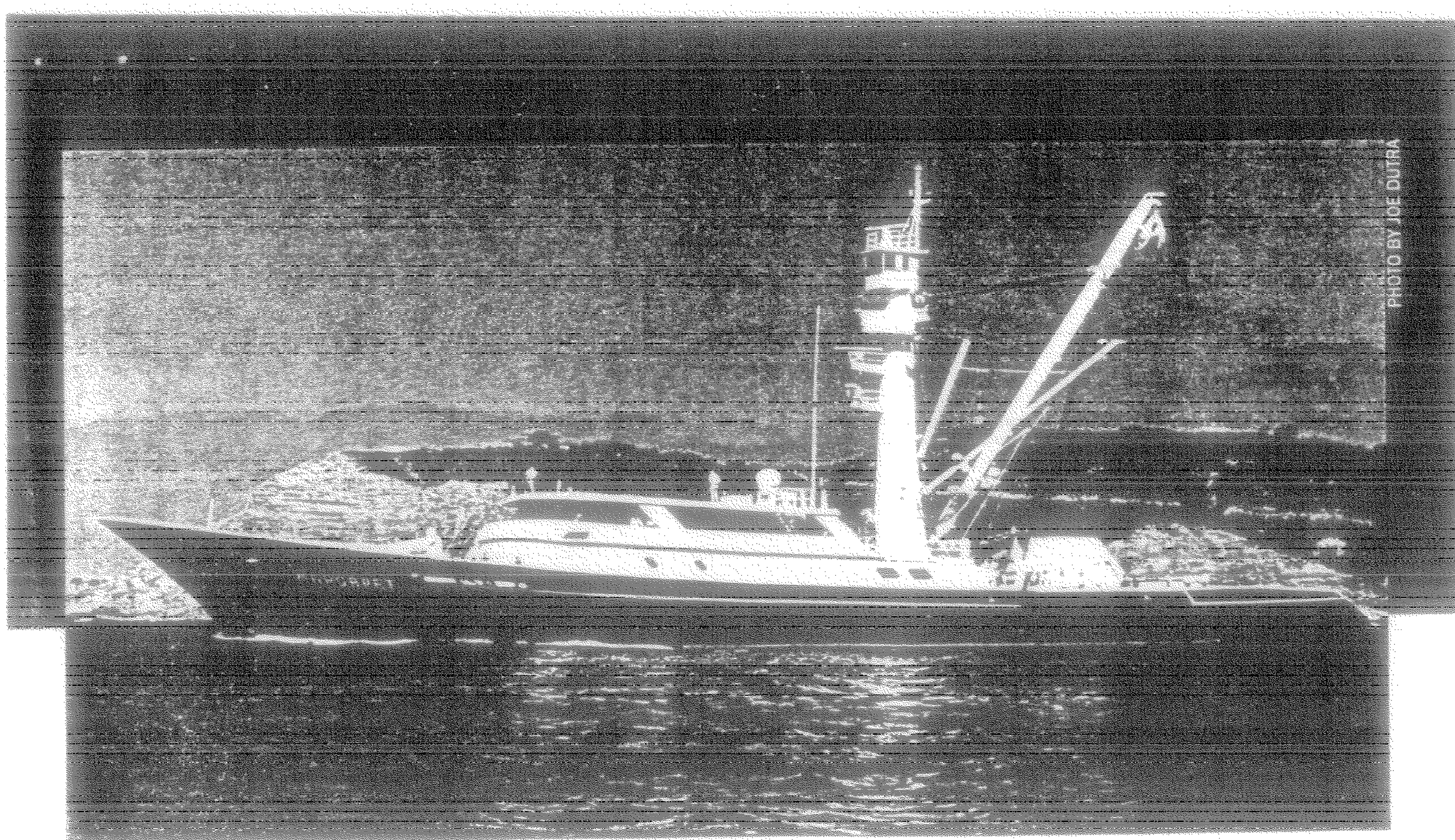


SAN DIEGO MARITIME MUSEUM

The annual retail consumption of canned tuna in the U.S. is currently more than 2.5 billion cans. That is only 28% of the world's consumption, which has grown at the average of 6% each year for the last 14 years. For shelf items in grocery stores measured by dollar volume per foot of shelf space, canned tuna is third to sugar and coffee.

Last year, a record 600,000 metric tons or the equivalent of all U.S. consumption was taken in the Eastern Pacific Ocean, the traditional fishing grounds for the U.S. tuna fishing fleet for over 70 years.[1] San Diego fishermen were among the pioneers of these productive waters and for decades this city was a major center of tuna landing and processing. But no more.

Why is San Diego no longer an important tuna port?[2] The answer is found in knowing what motivates successful U.S. tuna canners and fishermen. For fishermen, it is access to proven fishing grounds near timely and inexpensive unloading and servicing facilities. The dominant drive for the canner is access to a reliable, inexpensive source of supply near a low cost plant location. Foreign tuna canners greatly



Margaret Z, the last tuna super seiner built in San Diego by Campbell Industries in 1989.

benefit from low labor costs, moderate regulatory controls and other cost advantages. Even worse, foreign imports of water packed tuna benefit from very low duty rates in comparison with other major markets. U.S. government laws and regulations and U.S. canner buying policies currently make it too risky and burdensome to operate competitively with fleets of foreign flag seiners.

These are among the many factors reinforcing the widely held view that major canners will not be returning operations to San Diego anytime soon. Even so, San Diego remains a world center for tuna fishing technology, conservation and diplomacy. And the keeper of a rich and unique tuna fishing heritage.

Strong Poles, Strong Backs

The U.S. canned tuna industry was born of necessity in 1903 when sardines simply disappeared from the Eastern Pacific. A San Pedro sardine canner named A.J. Halfhill began substituting a little fished species of migrating tuna called "albacore."

By 1907, California "white meat tuna" packed in olive oil was finding wide acceptance in the Italian-American community in New York City. In 1911, at the foot of "F" Street, the first San Diego tuna cannery was in operation, competing against a host of similar operations up north in San Pedro. By the mid-1930s, San Diego had overtaken this competition in terms of fleet landings and cannery production.

San Diego's preeminence was based on the development here of large "baitboats," fishing vessels designed to carry a large volume of live bait into schools of migrating tuna. Releasing the bait into the tuna starts a feeding frenzy enabling the fishermen to boat the fish with bamboo poles and hooks.

In the summer of 1926, the first of the US tuna clippers, "Atlantic," was launched in San Diego by Campbell Machine Company. Captain Manuel O. Medina's gamble paid off. This new vessel met the need of supplying frozen "light meat tunas" to canners without establishing

Three tuna fishermen together haul in what could be up to 100 pounds of yellowfin tuna.

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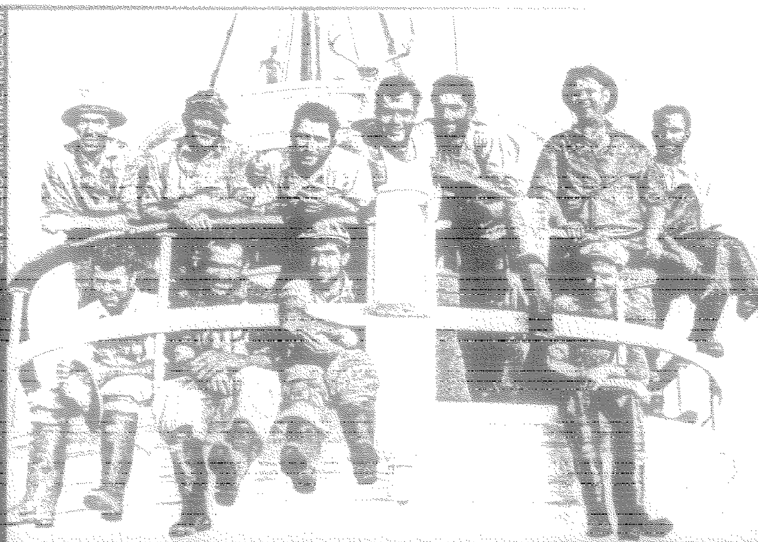

SAN DIEGO MARITIME MUSEUM

Captain Manuel G. Rosa, second from left in the back row, was one of the great pioneers of the tuna fleet in San Diego. He and his crew are seen here aboard their boat in the 1930's.

risky and costly foreign-based operations.[3] A fleet of 292 such boats were built between 1926 and 1959, most in San Diego shipyards for San Diego fishermen.

It is little known that during World War Two, 52 tuna clippers with 600 volunteer fishermen served in support of military operations throughout the Pacific theater, including Guadacanal, Midway, and Okinawa. Twenty one of these vessels and many of their crews never returned.

The war years strengthened the competitiveness of the San Diego tuna industry and set the stage for a major post-war expansion. Between 1945 and 1949, San Diego was the Tuna Capitol of the World. But by 1950, the Japanese tuna industry was starting to penetrate U.S. markets. Ironically, it was a movement largely financed and promoted by the U.S. Government.

The new competition started by selling low cost, duty-free frozen tuna to U.S. canners. Eventually they undercut the canners by selling low cost products directly to U.S. grocers. In response to this challenge, some U.S. canners developed new sources of frozen tuna supply from foreign fishermen operating in the South Atlantic and South Pacific. Tax exemptions, low labor costs and other advantages motivated two major US canners to build canneries in Puerto Rico and American Samoa. These same canners and others next invested in plants located in Peru and Ecuador.

The Purse Seine Revolution

American fishermen responded by changing their fishing tools. Baitboats were replaced by purse seiners which utilize nets to encircle schools of tuna without having to rely on the feeding frenzy behavior. In 1958, Captain Lou Brito of San Diego converted his tuna clipper "Southern Pacific" to a purse seiner and proved that the seining of tuna in the Eastern Pacific was the way to avoid bankruptcy and find new fishing success. 97 more of the remaining tuna clippers were quickly converted, mostly in San Diego shipyards. By 1961, new U.S. super tuna seiners were under construction alleviating (temporarily at least) the concerns of the few surviving U.S. canners looking for a reliable supply.

Over the past 40 years, 165 super tuna seiners entered the U.S. fleet, but most have since left. The seining technology was long ago transferred to

continued on page 47

AUGUST FELANDO *managed the affairs of the American Tunaboat Association in San Diego, California, from November 1960 to September 1991. Since that time he has been in sole practice specializing in maritime law and fisheries.*

His long career in the fishing industry began in 1946 as a commercial fisherman aboard the albacore baitboat, Treasure Island. He worked aboard several purse seiners fishing for sardines, mackerel, and tuna. He was a co-owner of the tuna clipper Challenger (1951-1958), and managing owner before its conversion to a seiner.

He received his L.L.B. degree from Loyola School of Law in 1954, and served from March 1955 to April 1957 as Staff Judge Advocate in the United States Air Force.

He has served professionally for many firms, as diverse as Campbell Industries and the Porpoise Rescue Foundation. He was the founder and first president of the National Council for Fishing Vessel Safety and Insurance and has served as a member of numerous government delegations and committees, including as a Fisheries Expert to the US Delegation to the UN Conference on Law of the Sea.

Augie, as he is known to friends and family, continues to work in Point Loma focusing on California commercial fishing history and its opportunities by representing various commercial fishing associations. His family is his life, and a good memory of this life is his goal.

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TUNAVILLE

continued from page 34

fishing nations around the world. Currently, the global fleet is composed of about 400 vessels and 7,000 fishermen.[4] Only 37 of these are U.S. vessels, 31 operating in the Western Pacific and the rest in the Eastern Pacific from ports other than San Diego.

There are only three U.S. canners left: Star-Kist Sea Food Company, Bumble Bee Seafoods, and Chicken of the Sea International. They operate only six plants, two in California, two in Puerto Rico, and two in American Samoa. Chicken of the Sea operates a plant in San Pedro, the last remaining cannery unloading tuna vessels in the continental U.S. Today, Star-Kist has a U.S. market share of about 48%, Bumble Bee, 23%, and Chicken of the Sea, 17%.

Bumble Bee Seafoods and Chicken of the Sea International have their principal offices, but no plants, in San Diego. Various organizations, representing all segments of the industry, have offices in San Diego. The world's first international organization to study tuna and make conservation recommendations, the Inter-American Tropical Tuna Commission (IATTC), has been located in San Diego since its creation by Treaty in 1949.[5] Government members are: Costa Rica, Ecuador, El Salvador, France, Japan, Mexico, Nicaragua, Panama, USA, Vanuatu, and Venezuela.

Rough Regulatory Waters

The U.S. laws and policies adversely affect U.S. tuna seiners' access to the commercially viable fishing grounds. For example, up until November 1990, the Magnuson Fishery Conservation and Management Act had protected and benefited the U.S. tuna industry since its adoption in 1976.[6] Under this statute, amended effective January 1992, the U.S. asserted sovereign rights and exclusive fishery management authority over tuna and other "highly migratory species."

Under this law, the U.S. now recognizes the right of other nations to require permission for fishing tuna within its 200-mile fishing zone. If a vessel is seized for violating foreign claims of jurisdiction recognized by the U.S., then the crew will receive no relief under the Fishermen's Protective Act of 1967 for the losses sustained.[7] Private insurance to cover such losses does not exist. In addition, under the Lacy Act, the U.S. may impose its own penalties for violating the foreign nation's law and regulation. 8

No regional tuna licensing arrangement exists in the Eastern Pacific. Many coastal nations, from Mexico to Chile, simply will not issue tuna fishing licenses to U.S. tuna boats. A few nations are willing to issue licenses, but the conditions imposed make

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purchase of these licenses highly unfeasible. As a practical matter, U.S. tuna seiners do not have access to tuna within the 200 mile fishing zones of 12 territorial fishing countries south of San Diego.

Tuna is abundant outside national 200 mile zones, but mostly yellowfin tuna, a species that travels with porpoise. The Marine Mammal Protection Act, as amended,[9] and its implementing regulations have severely limited the ability of US tuna seiners to fish these schools. Foreign vessels had no such laws to contend with.

Congress enacted the Dolphin Protection Consumer Information Act in 1990.[10] This Act set labeling standards for "dolphin safe" canned tuna sold in the US. This required onboard government observers to confirm that netting techniques cause no porpoise mortality or injury.[11] Yet the same law did not allow any part of the catch to be labeled "dolphin-safe."

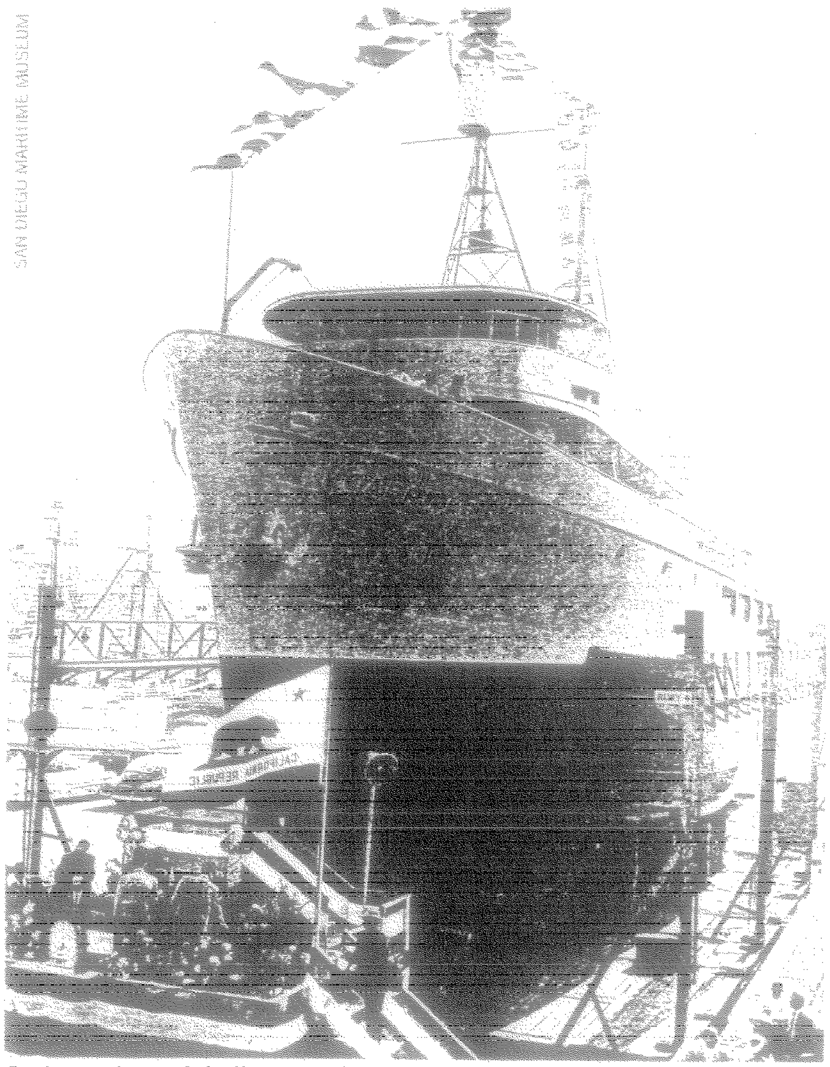
In 1992, Congress enacted the International Dolphin Conservation Act.[12] This Act banned the sale, purchase, transport, or import of any tuna that was not "dolphin-safe. In 1997, Congress finally enacted new standards by which yellowfin tuna caught by encircling a tuna/porpoise school could be sold as "dolphin-safe".[13] However, litigation has delayed application of these new rules.

The only mitigation available to U.S. tuna seiners to offset these negative impacts has been the South Pacific Tuna Treaty.[14] Under this Treaty, a regional tuna license arrangement permits 50 U.S. flag tuna seiners to fish within the 200 mile fishing zones of 16 South Pacific island states.

Since 1990, federal law has called for the Secretary of State to "initiate negotiations with respect to obtaining access for vessels of the United States fishing for tuna within the exclusive zones of other nations on reasonable terms and conditions."[15] Ten years have passed, but these negotiations have yet to be undertaken for the traditional Eastern Pacific fishing grounds.[16]

A Sunset Industry?

San Diego's canneries and seiners are gone, along with the support businesses that once serviced them. The living memory of the city's fishing heritage also fades with the passage of time. But the search for tuna continues. San Diego waterfront wags say that the canned tuna business is a "sunset" industry. They are right, but only in the sense that the sun never sets on a world hungry for quality canned tuna.



SAN DIEGO MARITIME MUSEUM

Steel tuna clipper Cabrillo prior to launch. C. Arnholt Smith's National Iron Works of San Diego built her in 1954.

[1] The EPO means 40(N. Lat. (California) to 45(S. Lat. (Chile) to 150 (W. Long. (near Hawaii).

[2] For 1999, the US 's catch was 3.4% of the total tuna catch in the EPO.

[3] "Light meat tunas" means tunas other than Albacore, namely Yellowfin, Bluefin, Bigeye, and Skipjack.

[4] "Super Tuna Seiners" means vessels of over 400 gross registered tons.

[5] 16 U.S.C. 951-961; 50 C.F.R. Parts 280 and 281

[6] 16 U.S.C. 1801-1882

[7] 22 U.S.C. 1971-1980

[8] 16 U.S.C. 3377(b)(2)

[9] 16 U.S. C. 1361-1421; 50 C.F.R. Parts 216, 228-229

[10] P. L. 101-627

[11] IATTC reports that 90% of net encirclements on tuna/porpoise schools result in zero mortality and that the annual total porpoise loss (< 0.1%) is so low as to be "biologically insignificant." The annual rate of porpoise population growth is about 3% to 4%. Decades ago, US fishermen developed the procedures and gear that allow successful porpoise release, creations that benefit foreign tuna fishermen operating in the EPO.

[12] P. L. 102-523

[13] P. L. 105-42

[14] 16 U.S.C. 973-973r

[15] 16 U.S.C. 1822.

[16] 16 U.S. C. 972-972h implements the "Eastern Pacific Ocean Tuna Fishing Agreement". However, this Agreement has not entered in force because of insufficient signatories.

State of California
Regional Water Quality Control Board
San Diego Region

EXECUTIVE OFFICER SUMMARY REPORT
February 21, 2001

ITEM: 15

SUBJECT: The Regional Board will consider affirmation or rescission of Addendum No. 3 to Cleanup and Abatement Order (CAO) No. 95-21 naming the San Diego Unified Port District (Port) as a responsible party for compliance with the CAO; rescission would be based upon a proposal by the Port to undertake cleanup and abatement pursuant to an agreement founded on the Polanco Redevelopment Act (Health & Safety Code Section 33459, et seq.). (Tom Alo)

PURPOSE: The purpose of today's hearing is for the Regional Board to receive testimony and consider whether to affirm or rescind the addition of the Port as a person responsible for cleanup or abatement under Section 13304 of the Water Code in CAO No. 95-21. The responsible parties named in CAO No. 95-21, as amended, now include the following: Campbell Industries, Marine Construction and Design Company (MARCO), and the Port of San Diego.

DISCUSSION: On October 27, 2000 the Regional Board issued Addendum No. 3 to CAO No. 95-21, adding the Port to the list of persons responsible for cleanup and abatement at the Campbell Shipyard site. The Regional Board subsequently stayed the effect of Addendum No. 3 to permit consideration of an alternative approach to cleanup and abatement by the Port using the redevelopment authority of the City of San Diego's Redevelopment Agency (RDA) through a Joint Powers Agreement. The RDA has approved the Joint Powers Agreement with the Port on January 23, 2001. The Board of Commissioners for the Port approved the same Joint Powers Agreement on January 31, 2001.

Campbell Shipyard has been located on the northeastern shore of San Diego Bay since 1926 on property leased from the Port. The Regional Board has regulated discharges of waste associated with shipyard activities at Campbell Shipyard for approximately 40 years under waste discharge requirements implementing applicable NPDES regulations as well as state and regional plans and policies (currently Order No. 97-36).

Since 1926, Campbell has operated a shipyard at the site. Campbell's shipyard activities have included the construction of commercial fishing vessels and the repair of naval ships. As a result of market changes, Campbell Industries proposed re-developing its shipyard site with a hotel. Currently, Campbell has discontinued shipyard operations and existing structures have been removed and demolished.

CAO No. 95-21 was issued on May 24, 1995. CAO No. 95-21 requires cleanup of wastes deposited in soil and bay sediments, or discharged to ground water, and abatement of conditions of pollution or threatened pollution associated with the deposition and discharge of waste; CAO No. 95-21 also establishes soil, groundwater, and sediment cleanup levels for Campbell Shipyards. On February 29, 1996 and November 12, 1997 the Regional Board issued Addenda Nos. 1 and 2, respectively, to CAO No. 95-21 to extend compliance dates; the current deadline for complete cleanup was June 1, 2000.

To date, Campbell Industries and MARCO have not begun cleanup activities at the site. On August 24, 2000, the Regional Board issued Notice of Violation No. 2000-137 for violation of CAO No. 95-21. The Notice of Violation asserts that Campbell Industries and MARCO have violated directives in CAO No. 95-21 that require complete cleanup of soil containing wastes, polluted groundwater, and bay sediment containing wastes at the Campbell Shipyard site by June 1, 2000 (Directives 3, 4, 5, 6, and 7).

The Port holds title to the Campbell Shipyard site, as trustee for the people of the state, and leased the site to Campbell Industries for use as an industrial shipyard. The Port thereby permitted the deposition of waste from Campbell's shipyard operations in soil and bay sediments from which the waste is likely to be, and has been, discharged to both surface water and ground water of the state, causing and threatening to cause conditions of pollution and nuisance. The Port is ultimately responsible for the reasonably foreseeable consequences of its action in leasing the Campbell Shipyard site to Campbell Industries and MARCO, including the obligation to clean up waste and abate conditions of pollution or threatened pollution associated with discharges or deposition of waste from ship construction, modification, repair, and maintenance activities at sites for which it is the trustee.

Prior to issuance of NOV No. 2000-137, the Port elected to perform all remaining remediation and demolition actions required under the terms of the Lease Termination Agreement between the Port and Campbell Industries. A remedial action workplan has been submitted by the Port for soil and groundwater cleanup at the site. Regional Board staff is currently reviewing this workplan. A remedial action workplan for bay sediment cleanup will be submitted to Regional Board staff at a later date.

A copy of Addendum No. 3 to CAO No. 95-21 is attached. Regional Board staff is currently revising the Polanco Redevelopment Agreement proposed by the Port. Upon acceptance of the revised agreement by the Port and Regional Board staff, a tentative resolution will be issued by the Executive Officer for consideration by the Regional Board. Staff hopes to include the revised Polanco Redevelopment Agreement and tentative resolution in the supplemental mailing.

LEGAL CONCERNS: None

SUPPORTING DOCUMENTS:

1. Cleanup and Abatement Order No. 95-21
2. Addendum No. 1 to CAO No. 95-21
3. Addendum No. 2 to CAO No. 95-21
4. Addendum No. 3 to CAO No. 95-21
5. Notice of Violation No. 2000-137
6. Port of San Diego Letter dated August 8, 2000
7. San Diego Union-Tribune, Officials Unite to Cleanup Bayfront Site (January 13, 2001)

RECOMMENDATION: Staff will provide a recommendation on this matter at the Regional Board meeting.

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN DIEGO REGION

CLEANUP AND ABATEMENT ORDER NO. 95-21

CAMPBELL INDUSTRIES
MARINE CONSTRUCTION AND DESIGN COMPANY

CAMPBELL SHIPYARDS
501 EAST HARBOR DRIVE
SAN DIEGO, CALIFORNIA

SAN DIEGO COUNTY

The California Regional Water Quality Control Board, San Diego Region (hereinafter Regional Board) finds that:

NPDES PERMIT STATUS

1. On April 22, 1985, the Regional Board adopted Order No. 85-01, NPDES Permit No. CA0107646, Waste Discharge Requirements for Campbell Industries, San Diego County. Order No. 85-01 established waste discharge requirements for a the threatened discharge of pollutants from a ship construction and repair facility to San Diego Bay, a water of the United States.

2. On October 23, 1989 the Regional Board adopted Addendum No. 1 to Order No. 85-01. The addendum modifies Monitoring and Reporting Program No. 85-01 to include sediment monitoring requirements and adds the San Diego Unified Port District as a secondary liable responsible party for purposes of compliance with Order No. 85-01, if Campbell Industries fails to comply with the Order and Addenda thereto.

3. Order No. 85-01 contains an expiration date of April 22, 1990. The Regional Board can enforce the terms and conditions of an expired permit under the authority of California Code of Regulations, Title 23, Section 2235.4. Section 2235.4 provides that the terms and conditions of expired NPDES permits are automatically continued if the discharger submits a complete application for permit renewal, prior to permit expiration. On October 19, 1989 Campbell Industries submitted a timely application for renewal of Order No. 85-01. Order No. 85-01 is enforceable pursuant to the provisions of Section 2235.4.

SITE LOCATION AND HISTORY

4. Campbell Shipyards (hereinafter Campbell) is located on the northeastern shore of San Diego Bay at 501 East Harbor Drive in the City of San Diego. The site is leased by Campbell Industries from the San Diego Unified Port District.

5. Campbell Industries, operator of Campbell Shipyards, was started by the Campbell Brothers in 1906. Campbell Industries began operation of Campbell Shipyards at its current location adjacent to San Diego Bay in 1926. Campbell Industries primary business has historically been the construction of commercial fishing vessels. Campbell Industries entered the Naval ship repair business in the early 1980's due to a decline in commercial fishing vessel orders.

6. A diesel and gasoline tank farm facility, owned and operated by General Petroleum Company, occupied the south parking lot of the Campbell site from at least 1939 to 1956. There is an abandoned diesel pipeline that runs along the southern portion of the Campbell site that may have been connected to the tank farm.

7. A San Diego Gas & Electric (SDG&E) facility is located approximately two blocks northeast of the Campbell Shipyards site. Campbell reports that this facility is a likely offsite source of petroleum-contaminated ground water. Petroleum production activities occurred at this site from 1888 through 1984, beginning with the production of oil gas from crude petroleum (in 1888), and followed by the generation of coal gas and oil gas. SDG&E switched from oil gas to natural gas in 1932.

8. Campbell Industries' predecessor, Campbell Machine Company, had facility structures that occupied the east parking lot area from the early 1900s to the 1930s. A number of other facilities owned by other entities have occupied all or parts of the east parking lot area, including an ice skating rink, a City of San Diego garbage disposal plant, other machining companies, and truck repair facilities. San Diego Unified Port District (SDUPD) owns and operates a maintenance facility adjacent to the east parking lot.

9. Campbell Industries is currently a California Corporation that is a wholly owned subsidiary of Marine Construction and Design Company Holding, Inc. of Seattle (MARCO), located at 2300 West Commodore Way, Seattle, Washington, 98199.

10. Campbell Industries proposes to redevelop the current leasehold. Under the proposed redevelopment plan, the shipyard activities at the site will cease entirely and the site will be converted to a public and commercial

recreational area. Campbell Industries has conducted a site investigation to identify polluted soils, ground water and bay sediment and determine appropriate remedial actions in order to expedite and facilitate the closure of the shipyard site.

DISCHARGERS NAMED IN THIS ORDER

11. The following parties are named as "dischargers" in this cleanup and abatement order pursuant to Water Code Section 13304:

    a) Campbell Industries in their capacity as the operators of Campbell Shipyards at the time when the unauthorized discharges occurred.

    b) MARCO Seattle in their capacity as the parent company to the operators of Campbell Shipyards.

SHIPBUILDING AND REPAIR SITE OPERATIONS

12. Shipbuilding and repair operations at Campbell Shipyards historically encompassed a large number and variety of activities and industrial processes including, but not limited to, formation and assembly of steel hulls; application of paint systems; installation and repair of a large variety of mechanical, electrical, and hydraulic systems and equipment; repair of damaged vessels; removal and replacement of expended/failed paint systems; and provision of entire utility/support systems to ships (and crew) during repair.

13. There were three major types of building/repair facilities at Campbell Shipyards, which, together with cranes, enabled ships to be assembled, launched, or repaired. These facilities were floating drydocks, marine railways, and berths/piers. With the exception of berths and piers, the basic purpose of each facility was to separate the vessel from the bay and provide access to parts of the ship normally underwater. Campbell Shipyards had three floating drydocks and three sets of marine railways of varying lengths and capacities. Campbell Shipyards also had five (5) berths. The berths and piers were overwater structures to which vessels were tied during repair or construction activities. Because drydock space was limited and expensive, many operations were conducted pierside. For example, after painting the parts of a ship normally

underwater, the ship was moved from the drydock to a berth where the remainder of the painting would be completed.

14. The primary activities at Campbell Shipyards involved a multitude of industrial processes, many of which were conducted over San Diego Bay waters or very close to the waterfront. As a result of these processes, an assortment of wastes were generated. The industrial processes at Campbell Shipyards included the following:

    a) SURFACE PREPARATION AND PAINT REMOVAL Methods of surface preparation and paint removal included dry abrasive blasting, wet abrasive or slurry blasting, hydroblasting, and chemical paint stripping.

    b) PAINT APPLICATION After preparation, surfaces were painted. Most painting occurred in a drydock and involved the ship hull and internal tanks. Painting was also conducted in other locations throughout the shipyard including piers and berths. Paint application was accomplished by way of air or airless spraying equipment and was a major activity at Campbell Shipyards.

    c) TANK CLEANING Tank cleaning operations used steam to remove dirt and sludges from internal tanks, particularly fuel tanks and bilges. Detergents, cleaners, and hot water may be injected into the steam supply hoses. Campbell reports that wastewater generated has typically been removed and disposed of by outside subcontractors.

    d) MECHANICAL REPAIR/MAINTENANCE/INSTALLATION A variety of mechanical systems and machinery required repair, maintenance, and installation.

    e) STRUCTURAL REPAIR/ALTERATION/ASSEMBLY Structural repair, alteration, and assembly generally involved welding, cutting, and fastening of steel plates or assembly blocks and other industrial processes.

    f) INTEGRITY/HYDROSTATIC TESTING Hydrostatic or strength testing (flushing) was conducted on hull, tanks, or pipe repairs. Integrity testing was also conducted on new systems during ship construction phases.

g) PAINT EQUIPMENT CLEANING All air and airless paint spraying equipment was generally cleaned following use. Paint equipment cleaning was a major producer of waste, including solvents, thinners, and paint wastes, and sludges.

h) ENGINE REPAIR/MAINTENANCE/INSTALLATION. Automotive repair, ship engine repair, maintenance, and installation generated waste oils, solvents, fuels, batteries, and filters.

i) STEEL FABRICATION AND MACHINING Fabrication of engine and ship parts occurred at Campbell Shipyards. Cutting oils, fluids, and solvents were used extensively including acetone, methyl ethyl ketone (MEK) and chlorinated solvents.

j) ELECTRICAL REPAIR/MAINTENANCE/INSTALLATION The repair, maintenance, and installation of electrical systems involved the use of numerous hazardous materials including trichlorethylene, trichloroethane, methylene chloride, and acetone.

k) HYDRAULIC REPAIR/MAINTENANCE/INSTALLATION The repair, maintenance, and installation of hydraulic systems involved the replacement of spent hydraulic oils.

l) TANK EMPTYING Bilge, fuel, and ballast tanks were typically emptied prior to ship repair activities.

m) FUELING Fueling operations occurred at Campbell Shipyards.

n) SHIPFITTING Shipfitting was conducted at Campbell Shipyards, and is defined as the forming of ship plates and shapes, etc. according to plans, patterns, or molds.

o) BOILER CLEANING Campbell reports that the vessels built and repaired, were primarily diesel vessels. Campbell reports that a few cases involving small auxiliary boiler cleaning on vessels were accomplished by sub-contractors who were required to carry away any spoils.

p) CARPENTRY Woodworking was conducted at Campbell Shipyards.

q) REFURBISHING/MODERNIZATION/CLEANING Refurbishing, modernization, and cleaning of ships processes were conducted at Campbell Shipyards.

r) AIR CONDITIONING/REFRIGERATION REPAIR Campbell reports that refrigeration repair was done almost exclusively on tuna vessels utilizing ammonia as a refrigerant.

MATERIALS USED

15. Materials commonly used at Campbell Shipyards are summarized below beginning with those utilized during floating drydock operations. Although a few specific materials are included, the list consists primarily of major categories.

a) ABRASIVE GRIT Typically slag was collected from coalfired boilers and consisting principally of iron, aluminum, silicon, and calcium oxides. Trace elements such as copper, zinc and titanium were also present. Sand, cast iron, or steel shot were also used as abrasives. Enormous amounts of abrasive were needed to remove paint to bare metal; removing paint from a 15,000 square foot hull can take up to 6 days and consume 87 tons of grit. Grit was needed in all dry and wet (slurry) abrasive blasting.

b) PAINT Paints contained copper, zinc, chromium, and lead as well as hydrocarbons. Two major types of paints were used on ship hulls:

(1) Anticorrosive Paints (primers)Vinyl, vinyl-lead, or epoxy based coatings were used. Others contain zinc chromate and lead oxide.

(2) Antifouling Paints were used to prevent growth and attachment of marine organisms by continuously releasing toxic substances into the water. Cuprous oxide and tributyltin fluoride or tributyltin oxide were the principal toxicants in copper-based and organotin-based paints, respectively.

c) Miscellaneous materials included the following: Oils (engine, cutting, and hydraulic); Lubricants, Grease; Fuels; Weld; Detergents, Cleaners; Rust Inhibitors; Paint Thinners; Hydrocarbon and Chlorinated

Solvents; Degreasers; Acids; Caustics; Resins; Adhesives/Cement/Sealants; and Chlorine.

WASTE GENERATED

16. Categories of wastes commonly generated by Campbell Shipyards industrial processes included but were not limited to those listed below.

a) ABRASIVE BLAST WASTE: SPENT GRIT, SPENT PAINT, MARINE ORGANISMS, RUST Abrasive blast waste, consisting of spent grit, spent paint, marine organisms, and rust was generated in significant quantities during all dry or wet abrasive blasting procedures. The constituent of greatest concern with regard to toxicity was the spent paint, particularly the copper and tributyltin antifouling components, which were designed to be toxic and designed to continuously leach into the water column. Other pollutants in paint included zinc, chromium, and lead. Abrasive blast waste can be conveyed by water flows, become airborne (especially during dry blasting), or fall directly into receiving waters.

b) FRESH PAINT Losses occurred when paint ended up somewhere other than its intended location (e.g., drydock floor, bay, worker's clothing). These losses were results from spills, drips, and overspray. Typical overspray losses were estimated at approximately 5% for air spraying; and 1-2% for airless spraying.

c) BILGE WASTE/OTHER OILY WASTEWATER This waste was generated during tank emptying, leakages, and cleaning operations (bilge, ballast, fuel tanks). In addition to petroleum products (fuel, oil), tank washwater also contained detergents or cleaners (nitrogen and phosphorus compounds) and was generated in large quantities. Campbell reports that for many years these wastes were disposed of off-site by sub-contractors.

d) BLAST WASTEWATER Hydroblasting generated large quantities of wastewater. In addition to suspended and settleable solids (spent abrasive, paint, rust, marine organisms) and water, blast wastewater also contained rust inhibitors such as diammonium phosphate and sodium nitrite.

e) OILS (engine, cutting, and hydraulic) In addition to spent products, fresh oils, lubricants, and fuels were released as a result of spills and leaks from ship or drydock equipment, machinery, and tanks (especially during cleaning and refueling).

f) WASTE PAINTS/SLUDGES/SOLVENTS/THINNERS These wastes were generated from cleaning paint equipment.

g) CONSTRUCTION/REPAIR WASTES AND TRASH These wastes included scrap metal, welding rods, slag (from arc welding), wood, rags, plastics, cans, paper, bottles, packaging materials, etc.

h) MISCELLANEOUS WASTES These wastes included lubricants, Grease; Fuels; Sewage (black and grey water from vessels or docks); Boiler Blowdown, Condensate, Discard; Acid Wastes; Caustic Wastes; Aqueous Wastes (with and without metals).

WASTE AND WATER DISCHARGES TO SAN DIEGO BAY

17. Actual and potential waste discharges to San Diego Bay from Campbell are described below. The discharges listed below were either the direct result of an industrial process (drydock, marine railway, or berth operations) or, more commonly, the result of water coming into contact with wastes, typically spent abrasive blast waste. There were numerous sources of waste discharge at Campbell Shipyards including industrial processes; building or repair facilities (e.g., floating drydock); vessels under repair (e.g., cooling water); bay water (e.g., due to tidal influence or wave action); storm water; or other sources.

a) FLOATING DRYDOCK DEBALLASTING (tanks) This discharge occurred when the ballast tanks were flooded with San Diego Bay water to lower the drydock and then emptied to raise the drydock. A floating drydock was typically submerged and raised twice for each ship docked.

b) FLOATING DRYDOCK SUBMERGENCE/EMERGENCE (platform) This discharge occurred when bay water flowed over the drydock platform each time the dock was sunk. Water was discharged over the ends of the platform and through sally ports and other openings each time the dock was raised. Sinking and raising typically occurred twice for each ship docked. Campbell reports that in recent years, it has damned the deck of the drydock and is collecting the runoff water, pumping it into tanks, analyzing it and then disposing of it. Campbell also reports that the deck of the drydock is swept clean before submergence.

c) FIRE PROTECTION SYSTEM DISCHARGE Campbell Shipyards had a fire protection system on the drydock, graving dock, berth, or pier. The system, which was in operation at all times when a ship was docked, consisted of constantly circulating bay water. Campbell reports that chemicals were not added to the system to prevent fouling.

d) COOLING WATER Cooling water was generated from vessels under repair, drydock equipment, pumps, etc.

e) Miscellaneous discharges or spills occurred during Floating Drydock Operations; Marine Railway Operations; Berth and Pier Operations; Storm water; Boiler Feedwater.

NPDES PERMIT VIOLATIONS

18. NPDES permits in the San Diego Region currently require shipyard and boatyard operators to follow best management practices (BMP) plans to prevent the discharge of substances such as refuse, rubbish, spent abrasive, paint, paint chips, and marine fouling organisms cleaned from ship or boat hulls. The operator of Campbell Shipyards, Campbell Industries, was required to submit a best management practices plan as part of the report of waste discharge for Order No. 85-01. The best management practices plan identified various measures that Campbell Industries would undertake to prevent the discharge of pollutants to San Diego Bay. The best management practices plan was accepted by the Regional Board and is summarized in Findings 8 and 9 of Order No. 85-01.

19. Order No. 85-01 contains the following applicable terms and conditions:

a) Prohibitions A.2: "The deposition or discharge of refuse, rubbish, materials of petroleum origin, spent abrasives (including old primer and antifouling paint), paint, paint chips, or marine fouling organisms into

San Diego Bay or at any place where they would be eventually transported to San Diego Bay is prohibited."

b) Discharge Specification B.3: "The discharger shall comply with the Water Pollution Control Plan described in Finding No. 9 (of Order No. 85-01)."

c) Provision D.1: "Neither the treatment nor the discharge of pollutants shall create a pollution, contamination, or nuisance as defined by Section 13050 of the California Water Code."

d) Provision D.11: "The discharger shall, at all times, properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the discharger to achieve compliance with the conditions of the Order."

20. Violations noted by Regional Board staff during compliance inspections of Campbell Shipyards from November 20, 1986 to July 31, 1992 are summarized below. This listing is not intended to be a complete listing of all Campbell Industries violations of Order No. 85-01 and prior NPDES permits. This violation listing is intended to illustrate some of the activities at Campbell Shipyards, which resulted in illicit waste discharges to San Diego Bay.

Inspection Violations

Date	Incident	Provision Violated
11/20/86	Navy ship undergoing repair at Pier 1 did not have boom extended far enough to catch floating waste material. This resulted in floating waste material in bay not being contained by booms. Sandblasting waste grit stockpiled in yard. Facility does not have berm around transformer containing PCBs, which is a violation of properly operating and maintaining all facilities and systems of treatment and control which are installed or used by the discharger to achieve compliance.	A.2, B.3, D.11

Inspection Violations (continued)

Date	Incident	Provision Violated
7/2/87	Dust, Paint, and Oil attributable to Campbell Shipyard operations was found floating in San Diego Bay near the dry dock.	A.2, B.3, D.11
11/20/87	Sandblast abrasive was discharged to San Diego Bay.	A.2, B.3, D.11
8/15/89	Sandblast waste entered bay from three drydocks, a marine railway and several piers. The storm drain had sandblast waste in it. The blasting area's wall is allowing sandblasting waste to go into San Diego Bay.	A.2, B.3, D.11
7/31/90	Blast material was apparent in various areas of the facility. Compressor was leaking oil into nearby San Diego Bay.	A.2, B.3, D.11
11/15/91	Discharger is deficient in controlling illicit waste dischargers to yard areas subject to surface flows, where it could be eventually transported to San Diego Bay.	A.2, B.3, D.11
4/29/92	Test Results of grit samples, from boat works area under the cradle which may be subject to tidal action where it could be eventually transported to San Diego Bay, show significant & hazardous levels of heavy metals.	A.2, B.3, D.1, D.11
7/31/92	Inadequate implementation of Best Management Practices on dry dock number two. Grit was apparent on the bay surface surrounding dock area.	A.2, B.3, D.11

BENEFICIAL USES

21. The "Water Quality Control Plan, San Diego Basin (9)" (hereinafter Basin Plan) was adopted by the Regional Board on September 8, 1994 and approved by the State Water Resources Control Board (State Board) on December 13, 1994. Subsequent revisions to the Basin Plan have also been adopted by the Regional Board and approved by the State Board.

22. The site described in this Order, 501 East Harbor Drive, San Diego, is located in the Lindbergh Hydrologic Subarea (908.21) of the San Diego Mesa Hydrologic Area (908.20) of the Pueblo San Diego Hydrologic Unit (908) as described in the Basin Plan.

23. The Basin Plan establishes no designated beneficial uses for ground waters in the San Diego Mesa Hydrologic Area.

24. The Basin Plan establishes the following designated beneficial uses for waters of San Diego Bay:

a) Industrial Service Supply
b) Navigation
c) Water Contact Recreation
d) Non-Contact Water Recreation
e) Ocean Commercial and Sport Fishing
f) Saline Water Habitat
g) Wildlife Habitat
h) Preservation of Rare and Endangered Species
i) Marine Habitat
j) Fish Migration
k) Shellfish Harvesting

WATER QUALITY GOALS FOR SAN DIEGO BAY

25. The following are water quality goals for San Diego Bay, based on the best professional judgement of the Regional Board.

Water Quality Goals for San Diego Bay	
Copper	2.9 µg/l
Lead	5.6 µg/l
Zinc	86 µg/l
TBT	0.005 µg/l

Water Quality Goals for San Diego Bay (continued)	
PCBs	0.00007 μg/l
PAHs	0.031 μg/l
Benzene	21 μg/l
Toluene	300 mg/l
Ethylbenzene	29 mg/l
Fluoranthene	42 μg/l

NPDES MONITORING PROGRAM

26. Campbell's NPDES permit monitoring program requires sediment monitoring at three (3) Remote Reference Stations. The purpose of these reference stations is to ascertain background chemical constituent concentrations for the purposes of evaluating incremental increases in sediment pollutant concentrations. Reference Station Number 3 is the closest of the three Reference Stations to Campbell Shipyards. Like the monitoring stations at Campbell Shipyards, the Reference Station is subject to many common sources of bay pollutants such as heavy boat or ship traffic and storm drain runoff. The important and obvious distinction between the Reference Station and the Campbell Shipyards monitoring stations, is that the Reference Station is not subject to the discharge of wastes from any shipyard, boatyard or Naval facility operations. A partial summary of the Reference Station Number 3 values from the report titled "Campbell Marine, NPDES Permit, Marine Sediment Monitoring and Reporting, Fourth Semi-Annual Report, June 1994" is presented below. This report was prepared for Campbell Marine by Ecosystems Mgt. Assoc. Inc. and submitted to the Regional Board on June 29, 1994.

Summary of Reference Station No. 3

Constituent	Average Values (mg/kg)
Arsenic	6.18
Cadmium	0.238*
Chromium	34.5
Copper	80.6
Lead	33.8
Mercury	0.354*
Nickel	9.97
LPAH	3.74*
HPAH	6.44*
PCB	0.0724*
PCT	4.61*

Summary of Reference Station No. 3 (continued).

Constituent	Average Values (mg/kg)
TBT	0.005*
TPH (Total)	41.9*
Silver	0.618*
Zinc	147

*Calculated average values include some sample results that were below the detection level; one-half the detection level sample result was used in the calculation.

The Regional Board believes it is reasonable to use the average values for Reference Station No. 3 summarized above, for the purposes of evaluating incremental increases in bay sediment pollutant concentrations at Campbell Shipyards.

27. Campbell's NPDES permit also requires sediment monitoring of eleven (11) Stations in San Diego Bay at Campbell Shipyards (CMB01-11), and four stations, CMB-STD 01, 02, 03, and 04 each located at the outlet of four storm drains which are tributary to the San Diego Bay at the Campbell Shipyard site. One storm drain outfall is located in Campbell's immediate area (CMB-STD-03), and three storm drain outfalls are located outside of Campbell's immediate area (CMB-STD 01,02,04). Below is a partial summary of the average values of these monitoring Stations for the period December 1992 to June 1994.

Summary of Campbell Stations CMB 01-11

Constituent	Average Values (mg/kg)
Arsenic	22.8
Cadmium	1.12
Chromium	143
Copper	961
Lead	238
Mercury	1.944
Nickel	24.6
LPAH	3.31'
HPAH	13.84'
PCB	0.6072'
PCT	9.70'
TBT	1.201
TPH (Total)	99.1*'
Silver	1.10*
Zinc	1015

'Data available only from stations CMB 01,04,08.
*Calculated average values include some sample results that were below the detection level; one-half the detection level sample result was used in the calculation.

Summary of Storm Drain Stations-Average Values (mg/kg)

Constituent	CMB-STD-03	CMB-STD-01,02,04
Arsenic	20.9	6.12
Cadmium	1.55	0.472
Chromium	162.5	28.5
Copper	722	119
Lead	283	110
Mercury	0.783	0.466
Nickel	37.2	5.91[*]
LPAH	no data	0.17[†]
HPAH	no data	1.05[†]
PCB	no data	0.0245[†]
PCT	no data	7.83[†]
TBT	0.061	0.045
TPH (Total)	no data	36.4[†]
Silver	1.1[*]	0.259[*]
Zinc	1372	264

[†]Data available only from station CMB-STD-01
*Calculated average values include some sample results that were below the detection level; one-half the detection level sample result was used in the calculation.

The NPDES monitoring data shows that all average constituent concentrations at Stations CMB 01-11 exceed the designated average background concentrations for Reference Station No. 3 except for low molecular weight PAHs. Storm Drains 1, 2 and 4 are tributary to the Campbell shipyard site but have a discharge point outside of the main area where major shipyard activities occurred. The outlet of Storm Drain 3 is located directly adjacent to areas where shipyard activities were conducted. The data indicates that constituent concentrations are significantly higher at Storm Drain 3 as compared to the other storm drains. The data indicates that the average constituent concentrations at Storm Drains 1, 2, and 4 exceed background values for cadmium, copper, lead, PCT, TBT and zinc. Average constituent concentrations markedly exceed background values at Storm Drain 3 for all constituent values. The higher concentrations at storm drain 3 are indicative of Campbell Shipyard activities and not storm water influence.

PTI TECHNICAL REPORTS

28. PTI Environmental Services prepared the following reports on behalf of Campbell Industries to determine appropriate remedial actions at the site:

a) "Study Proposal Campbell Shipyards Sediment Characterization - Phase 2" dated **July 1990** was submitted to the Regional Board by Campbell Industries on July 16, 1990. This Study Proposal contains sediment data from samples taken by the Regional Board in 1989 and a 1989 Campbell Industries study.

b) "Data Report, Campbell Shipyards, Sediment Characterization - Phase 2" Volumes 1 and 2 dated **June 1991**, for MARCO Seattle was submitted to the Regional Board by Campbell Industries on July 1, 1991. This Data Report summarizes additional sediment data collected during Phase 2 at Campbell Shipyards.

c) "Campbell Shipyards Remedial Action Alternatives Analysis Report" (**RAAAR**) dated October 1993, for MARCO Seattle was submitted to the Regional Board by Campbell Industries on November 15, 1993. The purpose of the RAAAR is to summarize the results of the sediment studies referenced above and to identify and evaluate whether sediment remediation would be warranted prior to redevelopment of the site, also included are Remedial Alternatives.

d) On October 13, 1994, Campbell Industries submitted a report entitled "Campbell Shipyards, Site Investigation and Corrective Action Report, Soil and Groundwater (SI/CAR)" dated October 1994, prepared by PTI Environmental Services. The purpose of the SI/CAR is to summarize the results of the soil and groundwater studies conducted at Campbell Shipyards and to identify and evaluate candidate remedial alternatives for the site prior to redevelopment.

PTI BAY SEDIMENT DATA

29. Below is a partial summary of the San Diego Bay sediment data contained in the **July 1990** PTI report:

Summary of Sediment Data Collected by San Diego Regional Water Quality Control Board, 1989

Constituents	Concentration Range (mg/kg)	Constituents	Concentration Range (mg/kg)
TOC[1]	9,380 - 66,100	Lead	30.1 - 231
PCB[2]	0.17 - 3.3	Mercury	<0.763 - 2.62
Arsenic	4.50 - 29.0	Nickel	8.60 - 20.9
Cadmium	<0.486 - 2.14	Silver	1.37 - 7.26
Chromium	40.2 - 257	Zinc	245 - 902
Copper	194 - 1,190	TBT[3]	1.2 - 13

Summary of Sediment Data Collected by CAMPBELL SHIPYARDS, 1989

Constituents	Concentration Range (mg/kg)	Constituents	Concentration Range (mg/kg)
Arsenic	7.30 - 107	Silver	< 1.00 - 4.90
Cadmium	2.60 - 23.4	Zinc	68.4 - 2,870
Chromium	6.00 - 369		
Copper	28.8 - 2,010	TBT[3]	< 0.006 - 0.99
Lead	11.7 - 399	TPH[4]	73 - 5,000
Mercury	< 0.280 - 3.90	LPAH[5]	0.340 - 7.70
Manganese	54.6 - 1,570	HPAH[6]	0.250 - 74.0
Nickel	6.30 - 41.5	PCB[2]	0.053 - 7.10

< = Undetected at level shown
[1]TOC = Total Organic Carbon
[2]PCB = Total Polychlorinated Biphenyls
[3]TBT = Tributyltin
[4]TPH = Total Petroleum Hydrocarbons
[5]LPAH = Total Low Molecular Weight Polycyclic Aromatic Hydrocarbons
[6]HPAH = Total High Molecular Weight Polycyclic Aromatic Hydrocarbons

30. San Diego Bay sediment samples from the **June 1991** PTI report are summarized below:

BAY SEDIMENT SAMPLES

Constituent	CONCENTRATION RANGE at Reference Stations	CONCENTRATION RANGE at Site Stations
Arsenic	7.2 - 80.4 mg/kg	11.5 - 66.6 mg/kg
Cadmium	0.30 - 0.80 mg/kg	0.02 - 2.3 mg/kg
Chromium(total)	43.0 - 142 mg/kg	35.0 - 480 mg/kg
Copper	55.0 - 179 mg/kg	75.0 - 2,500 mg/kg
Lead	27.1 - 128 mg/kg	60.9 - 1,100 mg/kg

BAY SEDIMENT SAMPLES (continued)

Constituent	CONCENTRATION RANGE at Reference Stations	CONCENTRATION RANGE at Site Stations
Mercury	0.18 - 0.74 mg/kg	0.11 - 3.05 mg/kg
Nickel	14.0 - 25.0 mg/kg	14.0 - 70.0 mg/kg
Silver	0.50 - 1.60 mg/kg	0.40 - 28.0 mg/kg
Zinc	150 - 304 mg/kg	168 - 2,600 mg/kg
Monobutyltin	17.8 - 96.9 µg/kg	7.56 - 537 µg/kg
Dibutyltin	14.2 - 29.1 µg/kg	4.79 - 454 µg/kg
Tributyltin	51.5 - 124 µg/kg	52.9 - 16,300 µg/kg
Tetrabutyltin	4.44 - 22.0 µg/kg	0.969 - 7.3 µg/kg
LPAH[1]	990 - 5,200 µg/kg	21 - 16,000 µg/kg
HPAH[2]	146 - 19,000 µg/kg	350 - 96,000 µg/kg
Diesel fuel	18 - 28 mg/kg	17 - 130 mg/kg
Petroleum oil	870 - 1,800 mg/kg	620 - 4,400 mg/kg
Total PCBs[3]	8.9 - 880 µg/kg	17 - 8,100 µg/kg
Total PCTs[4]	89 - 1,200 µg/kg	110 - 3,400 µg/kg

[1]LPAH = Total Low Molecular Weight Polycyclic Aromatic Hydrocarbons
[2]HPAH = Total High Molecular Weight Polycyclic Aromatic Hydrocarbons
[3]PCB = Total Polychlorinated Biphenyls
[4]PCT = Total Polychlorinated Terphenyls

31. The data listed in the two preceding findings show that a large majority of the constituent concentrations at the site exceed background levels at the NPDES monitoring program reference station No. 3.

32. The PTI **RAAAR** report states that petroleum hydrocarbon and polynuclear aromatic hydrocarbon contamination along the shoreline in the vicinity of Dry Docks 1 and 2, particularly the presence of oil and PCBs, suggests that oil underlying the site, and possibly deriving from the oil production and storage facilities located upland of the Campbell Shipyards facility, has leaked through the bulkhead and infiltrated the adjacent sediments.

PTI SEDIMENT QUALITY OBJECTIVES

33. There are currently no sediment quality objectives established for use in California. Sediment quality objectives are currently under development by the State Board pursuant to Chapter 5.6 Section 13390 et. seq. of the California Water Code. In the absence of such objectives,

site-specific sediment quality objectives were developed by PTI, using the following methods:

a) WATER QUALITY OBJECTIVES - Determination of the limiting sediment concentration that would not cause California Enclosed Bays and Estuaries Plan water quality objectives to be exceeded. (Note - In 1994, the Bays and Estuaries Plan was rescinded, and is currently being redrafted by the California State Water Resource Control Board.)

b) TOXICITY - Determination of site specific advanced effects threshold (AET) sediment toxicity values. AET is defined as the sediment concentration of a contaminant above which statistically significant ($P<0.05$) adverse effects for a particular biological indicator are always expected relative to appropriate reference conditions. Sediment concentrations in excess of AET values may be indicative of historical and/or current shipyard waste discharges and may also adversely affect the water quality and beneficial uses of the water.

34. PTI's development of sediment quality objectives, based on conformance to the Bays and Estuaries Plan, required the determination of the relationship between the concentration of the chemical in water and the concentration of the chemical in sediments. Chemical concentrations in pore water were directly related to chemical concentrations in sediment, by the following two methods:

a) The direct measurement approach - This approach was applied to copper, lead, zinc, and TBT. PTI reported that sediment/water concentration ratios varied at the different sampling stations, probably because the behavior of metals is controlled by complex set of processes, including complexation with dissolved ligands, varying affinities of different chemicals for different particle types and surfaces, and oxidation/reduction reactions. PTI also reports it is likely the measured pore metal water concentrations for copper, lead, zinc, and TBT are overestimates of actual concentrations because clean techniques were not used (or required) at the time samples were collected. Recent guidance from EPA recommends that clean sample handling techniques be used for metal levels in the low µg/l range. Otherwise, substantial contamination can occur resulting in measured concentrations that are higher than actual concentrations. This guidance was not in place at the time the samples were collected.

b) Derived partition coefficient - Sediment quality, for organic chemicals, used partition coefficient values derived from the scientific literature. These partition coefficients, and estimated sediment quality objectives are summarized below:

SEDIMENT QUALITY OBJECTIVES ESTIMATED FROM CALIFORNIA ENCLOSED BAYS AND ESTUARIES PLAN WATER QUALITY OBJECTIVES

Chemical	California Enclosed Bays and Estuaries Plan Water Quality Objectives ($\mu g/L$)	Partition Coefficient (L/kg sediment)	Estimated Sediment Quality Objective (mg/kg dry weight)	
Copper	2.9	$3.4x10^5$	990	
Lead	5.6	$2.3x10^6$	13,000	
Zinc	86	$6.6x10^4$	5,700	
TBT	0.005	$7.2x10^3$	0.033	
		L/kg Organic Carbon (K_{oc})	Organic Carbon (mg/kg)	Dry Weight (mg/kg)
PAH	0.031	$6.3x10^4$	1.9	0.039
PCB	0.00007	$4.0x10^5$	0.03	0.0007

35. PTI's development of AET site-specific sediment quality objectives, presented below, were derived from observed relationships between biological data (i.e., sediment toxicity tests and in situ benthic infauna assessed and integrated into sediment quality objectives to define site-specific cleanup levels.

Summary of AET Site-specific values
(mg/kg dry weight)

Chemical	Site Specific Sediment Quality Obj.
Copper	810
Lead	231
Zinc	820
Tributyltin	5.75
High molecular weight polycyclic aromatic hydrocarbon	44
Polychlorinated biphenyls	0.95
Total petroleum hydrocarbons	4,300

REGIONAL BOARD BAY SEDIMENT DATA CONCLUSIONS

36. Based on the PTI RAAAR report and Campbell Shipyard sediment data and reports described in previous findings the Regional Board concludes the following:

a) Copper and zinc share similar distribution patterns with elevated concentrations along the shoreline and adjacent to the dry docks. Concentrations decrease rapidly with increased distance from the site and typically reach background or near background levels just bayward of the docks and piers. The majority of copper and zinc in the bay sediments was caused by Campbell's shipbuilding and repair activities. Copper and zinc are key constituent of the paints used ion ship construction. Copper is also present at elevated concentrations in the blasting slag used in this construction and repair.

b) The concentration of lead in bay sediments is elevated with respect to background levels. Lead concentrations adjacent to the four storm drains at the site suggest that these storm drains may contribute lead to bay sediments. Discharges from the Campbell site have also contributed to elevated lead concentrations in bay sediments. Lead was a common constituent of paint used at the site. In addition, lead is present at elevated concentrations in upland soils at the site.

c) Mercury distribution patterns are similar to those of copper and zinc, but display a much narrower range of concentrations. The highest concentrations are observed along the shoreline and adjacent to the dry docks. Concentrations of mercury decrease to near background levels just bayward of the piers and dry docks. Discharges from the Campbell site have contributed to elevated mercury concentrations in bay sediments. Mercury is not contained in any of the paint currently used at the site; however, it has been used historically in antifouling paints. Mercury concentrations adjacent to Storm drains 2 and 4 indicate that these storm drains have not contributed to the elevated mercury found in bay sediments at the site.

d) The distribution pattern of TBT is similar to that of copper and zinc. The highest concentrations are found immediately adjacent to the dry docks, with some elevated concentration extending bayward of the site. The majority of TBT in the bay sediments was caused by Campbell's shipbuilding and repair activities. Discharges from the Campbell site have contributed to elevated TBT concentrations in bay sediments. TBT was present as a copolymer in the antifouling paint used at the site.

e) Polynuclear Aromatic Hydrocarbons are present in crude oil, fuel oils, and crankcase oil. Combustion of this fuel creates contaminated particulates (soot) which falls back on land and may eventually be washed into the bay by storm runoff. Oil spills in San Diego Bay also contribute to elevated concentrations of PAH's in San Diego bay sediments. In general, elevated concentrations of Low Molecular Weight Polynuclear Aromatic Hydrocarbons (LPAH) and High Molecular Weight Polynuclear Aromatic Hydrocarbons (HPAH) are more localized than those of metals and are elevated along the Campbell site shoreline. LPAH concentrations are generally below background throughout the site with the exception of two locations, one location adjacent to the storm drain near the northern end of the Campbell shoreline and another location in the vicinity of the outlet of the large dry dock. HPAH elevated concentrations are generally located along the shipyard shoreline. The LPAH and HPAH concentrations along the shoreline in the vicinity of Dry Docks 1 and 2, suggests that oil underlying the site has leaked through the bulkhead and infiltrated the adjacent bay sediments. Wastes generated at the site included bilge waste/ other oily wastewater, oils, lubricants, grease, and fuels. LPAH and HPAH concentrations adjacent to the storm drains indicate that these storm drains have not contributed significantly to LPAH and HPAH concentrations in the bay sediment.

f) Concentrations of PCBs in bay sediments are above background levels along the Campbell shoreline. The higher PCB sediment concentrations (value grater than 1 mg/kg) were generally located in the area where shipyard activities were conducted. Ship hydraulic system and repair and paint application activities were conducted at Campbell. Wastes generated at the site included fresh and spent paint - sludges/ solvents/ thinners, and waste hydraulic oils. These wastes may have contained PCB's in the past. The PCBs may also have originated from the San Diego Gas and Electric facility described in Finding 7. PCB concentrations adjacent to the storm drains at the site indicate that these storm drains did not contribute significantly to PCB concentrations in the bay sediment.

g) Total petroleum hydrocarbons (TPH) are elevated above background in the bay sediment along the Campbell site shoreline. Concentrations of TPH decrease to near background levels just bayward of the piers and dry docks. The sources of TPH are the same as described for PAH's.

h) Waste discharges from Campbell Shipyards to San Diego Bay have occurred in violation of Order No. 85-01. It appears that the Best Management Practices plans employed by Campbell Industries were either inadequate or were being ineffectively implemented to prevent waste discharges to San Diego Bay.

i) The contaminated bay sediments present at Campbell Shipyards have caused or threaten to cause a condition of pollution as described in California Water Code Section 13050. Bay sediment concentrations of copper, zinc, lead, tributyltin, high molecular weight polynuclear aromatic hydrocarbons (HPAH),polychlorinated biphenyls (PCB), and total petroleum hydrocarbons (TPH) exceed site specific AET values and thus may adversely affect San Diego Bay beneficial uses.

PTI SOIL AND GROUND WATER DATA

37. Chemical concentrations in soil reported by PTI in the SI/CAR report are summarized below:

Chemical Concentrations in soil

Chemical	Detection Frequency	Concentration Range	Units	Location of Maximum concentration: Station	Location of Maximum concentration: Depth Horizon (ft bgs)
TRPH	63/91	5 U - 37,000	mg/kg	B-6	1-1.5
TPH	36/74	0.5 U - 9,000	mg/kg	B-25	3-3.5
Naphthalene	10/26	500 U - 5,800,000	µg/kg	B-31-P	3-3.5
Benzo[a]pyrene	16/26	170 U - 520,00	µg/kg	B-31-P	3-3.5
Benzene	1/55	500 U - 1,200	µg/kg	MW-5	7-7.5
Toluene	7/55	5 U - 4,000	µg/kg	MW-5	7-7.5
Ethylbenzene	4/55	5 U - 390	µg/kg	MW-5	7-7.5
Xylene	5/55	10 U - 2,100	µg/kg	MW-5	7-7.5
1,2 - Dichlorethane	1/48	5 U - 6.1	µg/kg	MW-1-N	8-8.5
Tetra-chloroethylene	1/48	5 U - 140	µg/kg	B-19	3-3.5
PCBs	2/14	50 U - 1,800	µg/kg	B-31	3-3.5
Lead	72/89	0.05 U - 8,300	mg/kg	B-20-P	5-5.5
Copper	57/58	0.1 U - 1,200	mg/kg	B-38	1-1.5
Zinc	54/54	3.2 - 4,300	mg/kg	B-27	1-1.5

U - Undetected at levels shown

38. The PTI SI/CAR report identified seven major soil contamination areas:

a) The south parking lot had total petroleum hydrocarbon soil contamination greater than 1,000 mg/kg at borings B-24, B-25, B-25-P, B-26, and B-42. The vertical extent of elevated petroleum hydrocarbon concentrations extends from the ground surface down to the shallow groundwater surface. The soils in the south parking lot and near MW-5 had detectable concentrations of benzene, toluene, ethylbenzene, and xylene (BTEX) compounds. PTI reports that the south parking lot was a former tank farm facility owned by General Petroleum Company from at least 1939 to 1956. The tank farm may have been the source of this contamination.

b) The east parking lot had total petroleum hydrocarbon soil contamination greater than 1,000 mg/kg at borings B-31-P, B-32-P, and well MW-1-N. This area also had detectable concentrations of PAHs. Naphthalene, a PAH, was detected as high as 5,800,000 µg/kg at boring B-31-P. PAHs were also detected at Boring B-42. 1,2-Dichloroethane was detected in MW-1-N soils at 6.1 µg\kg. Possible sources of PAH's in this area include the City of San Diego garbage disposal plant, other machining companies, and truck repair facilities. Campbell Machine Company, had facility structures that occupied the east parking lot area from the early 1900s to the 1930s. San Diego Unified Port District (SDUPD) owns and operates a maintenance facility adjacent to the east parking lot.

c) The paint shop/sand blasting area had total petroleum hydrocarbon soil contamination greater than 1,000 mg/kg at boring B-19. PCB was detected in two boreholes near a transformer substation. Soils at B-35 near an electrical and telephone vault and weld shop and B-31 near the paint shop sand blasting area had PCB concentrations of 470 µg/kg and 1800 µg/kg respectively. Tetrachloroethylene was detected in B-19 soils at 140 µg/kg.

d) A site near the Coast Guard recovery well had total petroleum hydrocarbon soil contamination greater than 1,000 mg/kg at borings B-15 and B-17.

e) A site along the seawall near the pipe shop area had total petroleum hydrocarbon soil contamination greater than 1,000 mg/kg at borings B-6 and B-37.

f) A site in the vicinity of well MW-5 had total petroleum hydrocarbon soil contamination greater than 1,000 mg/kg at borings B-29.

g) A site near the parts warehouse along Harbor Street had total petroleum hydrocarbon soil contamination greater than 1,000 mg/kg at borings B-6-P and CS21. Lead, copper, and zinc were found at elevated concentrations in the shallow soils beneath and northwest of the parts warehouse. Campbell reports that lead affected soils may be due to historical uses, including spreading ash from a City of San Diego incinerator that operated in this area.

39. The concentrations of all metals that exceeded background and all organic compounds were compared by PTI with risk-based concentrations for industrial soils derived using USEPA methods. PTI found that six of the carcinogenic PAH compounds in soil exceeded the risk based concentration level. PAH compounds are known toxic constituents of total petroleum hydrocarbons. Based on a review of the soil TPH data, the hydrocarbon identification analysis, risk based soil PAH concentrations, and site characteristics, the following site-specific cleanup levels were proposed by PTI:

a) PAHs - 3.9 mg/kg for toxic equivalent concentrations (TECs) of benzo[a]pyrene.

b) Total petroleum hydrocarbons - 1000 mg/kg.

40. The PTI SI/CAR report summarized the nature and extent of the site **ground water** contamination as follows:

a) Petroleum hydrocarbons - PTI reports that Ninyo & Moore performed an investigation of the Campbell shipyards site in 1989. According to this investigation total petroleum hydrocarbons (TPH) concentrations in ground water samples from monitoring wells on the neighboring San Diego Unified Port District (SDUPD) maintenance shop had TPH concentrations ranging from undetected (at 50 $\mu g/l$) to 1,560 $\mu g/l$ in MW-9-N immediately upgradient of the east parking lot. Later investigations by Thorne (1990) and Park (1991) indicated that none of the wells they sampled had detectable quantities of petroleum hydrocarbons. TPH was not analyzed during PTI's resampling of site wells in 1993.

b) PAH - During the December 1993 sampling by PTI, PAHs were detected in three wells at or near the East parking lot. On the Campbell site the two wells were MW-1-N (Naphthalene 600 $\mu g/l$, Acenaphthene 15 $\mu g/l$, and Acenaphthylene 40 $\mu g/l$) and MW-2-N (Naphthalene 34 $\mu g/kg$). Adjacent to the east parking lot on the SDUPD maintenance shop the third well with PAHs was MW-9-N (Acenaphthene 20 μg/l, Fluoranthene 25 μg/l, Pyrene 35 μg/l, Benzo [b,k], fluoranthene 11 μg/l, and Benzo [g,h,i], perylene 10 μg/l).

c) BTEX and VOCs - During the December 1993 sampling by PTI, seven wells had detectable concentrations of BTEX compounds; four of these wells are on the Campbell Shipyards site. MW-1-P, MW-2-N, and MW-6 had benzene concentrations of 660 μg/l, 4 μg/l, and 2 μg/l, respectively, and MW-1-P had ethylbenzene concentration of 47 μg/l. In addition, cis-1,2-dichloroethene was detected in MW-8-N, MW-1-P, MW-2-N, and MW-1 at concentrations ranging from 5 to 78 μg/l. Chlorobenzene was detected in MW-6 at 14 μg/l and 1,2-dichlorethane was detected in two offsite wells, MW-3-N and MW-9-N, at 1 μg/l.

d) Pesticides/PCBs - Pesticides and PCBs were not detected in ground water by Park in 1991.

e) Metals - Samples from wells MW-8-N, MW-3, and MW-4 were analyzed for dissolved lead, copper, and zinc by PTI in 1993. None of the metals were detected (at a detection limit of 0.5 mg/l) during this round of sampling.

f) Free product - Floating petroleum product was measured in two site wells MW-5 and the Coast Guard recovery well. Floating product samples were analyzed for hydrocarbon identification, BTEX, VOCs, and semivolatile organic compounds (SVOCs). The results of the hydrocarbon identification indicated that 94 percent of the MW-5 sample and 25 percent of the Coast Guard recovery well sample were diesel-range hydrocarbons. No gasoline or heavier oil-range hydrocarbons were identified in the samples.

REGIONAL BOARD GROUND WATER AND SOIL DATA CONCLUSIONS

41. Based on review of the PTI, Regional Board and Campbell Shipyard soil and ground water data and reports described in previous findings the Regional Board finds and concludes the following:

a) Elevated concentration of total petroleum hydrocarbon (TPH) and polynuclear aromatic hydrocarbons (PAHs) in soil and ground water indicate that historic activities in the east parking lot by Campbell Machine Company, the adjacent San Diego Unified Port District (SDUPD) maintenance facility, a City of San Diego garbage disposal plant, other machining companies, and truck repair facilities may have contaminated ground water under the east parking lot of the site.

b) On-site data indicate that soil contaminants in the east parking lot are degrading and not migrating toward the bay.

c) The soils in the south parking lot had elevated concentrations of BTEX compounds, PAHs and TPH. Activities at a former tank farm owned by General Petroleum Company from at least 1939 to 1956 may have contaminated soils in the south parking lot.

d) Two site wells along the seawall, MW-5 and the Coast Guard recovery well, contain floating product. Adjacent wells within 200 feet along the seawall do not contain floating product, suggesting that the two areas are localized and that floating product is not a site-wide problem. Analyses of floating product in the two wells indicate that the product is primarily diesel fuel with some probable mixing with a heavier hydrocarbon fuel, especially in the Coast Guard recovery well. Analytical results also suggest that some degradation of the diesel fuel has occurred in both areas. Most of the diesel-type fuels in these wells may have come from abandoned diesel pipelines that cross the site. The floating product in the recovery well may also be a mixture of other hydrocarbons that have migrated from the former General Petroleum Company tank farm area (the south parking lot), Campbell Shipyard on-site activities involving use of fuel products, or from other sources that could not be identified from the available historical data.

e) The contaminated soil and ground water present at Campbell Shipyards have caused or threaten to cause a condition of pollution as described in California Water Code Section 13050 because:

(1) Floating product on the shallow ground water surface is a potential ongoing source of dissolved or pure-phase releases of petroleum hydrocarbon contamination to the bay if left in place.

(2) Contaminated soils and ground water containing TPH, PAHs, and BTEX compounds near the bulkhead threaten to cause applicable bay water quality target values to be exceeded. The contaminated soil and ground water has also contributed to elevated concentration of TPH and PAHs in bay sediments adjacent to the shoreline.

(3) The maximum detected concentrations for six of the carcinogenic PAHs (benzo[a]pyrene, benz[a]anthracene, benzo[b]fluoranthene, chrysene, dibenzo[a,h]anthracene, and indeno[1,2,3-cd]pyrene) were higher than the human health risk-based concentrations for contaminated soil ingestion and dermal exposure developed by US EPA.

ALTERNATIVE CLEANUP LEVELS

42. Several alternative bay sediment cleanup levels for the site were evaluated by PTI including (1) no cleanup (with reliance upon natural recovery processes), (2) cleanup to background levels, (3) cleanup to site specific levels, (4) two intermediate cleanup levels between background and the site specific AET objective, and (5) cleanup to levels to conform with Bays and Estuaries water quality objectives. The specific alternative cleanup levels are summarized below.

Alternative Sediment Cleanup Levels (mg/kg)

Con-stituent	Regional Board Background	Mid Level Cleanup Obj.	PTI LAET* Site-Specific Obj. with safety factor	PTI LAET Site-Specific Obj.	PTI LAET Mid Level Site-Specific Obj.	PTI 2nd LAET Site-Specific Obj.
Copper	81	445.3	729	810	1,130	1,450
Zinc	147	483.5	738	820	1,460	2,100
TBT	0.005	2.88	5.18	5.75	--	--
Mercury	0.35	-	-	-	--	--
Lead	34	132.4	207.9	231	365	500
PAH	-	-	39.6	44	--	--
PCB	0.07	0.51	0.855	0.95	--	--
TPH	42	2170.95	3870	4300	--	--

*PTI LAET - Lowest apparent effects threshold developed by PTI.

43. PTI considered several alternatives for attaining the various alternative cleanup levels. Offsite confined aquatic disposal was rejected because it was considered highly unlikely that a suitable location would be found within San Diego Bay, and the costs associated with transporting the sediment to the open ocean would be excessive. The natural recovery alternative was rejected by the Regional Board because several of the sediment contaminants at the site are metals and do not biodegrade. These alternatives and costs are summarized below:

SUMMARY OF ESTIMATED REMEDIAL ACTION COST (in Million $)

		Cleanup to					
Alternative		Regional Board Back-ground	Mid Level Cleanup Obj.	PTI LAET* Site-Specific Obj. with safety factor	PTI LAET Site-Specific Obj.	PTI LAET Mid Level Site-Specific Obj.	PTI 2nd LAET Site-Specific Obj.
A	Natural Recovery	$0.07	$0.07	$0.07	$0.07	$0.07	$0.07
B	Cap in Place	$6.7	$4.5	$1.7	$1.1	$0.38	$0.34
C	Hydraulic Dredging	$27	$19	$7.6	$4.6	$1.13	$0.95
D	Mechanical Dredging	$24	$17	$6.7	$4.1	$1.01	$0.85
E	Stabiliza-tion with Offsite Disposal	$38	$27	$11	$6.4	$1.56	$1.3

*PTI LAET - Lowest apparent effects threshold developed by PTI.

The estimated area and volume of contaminated sediment are described below;

AREA AND VOLUME ESTIMATES FOR CANDIDATE CLEANUP SCENARIOS

Cleanup Scenario	Area (acres)	Volume (cubic yards)
1. Background	32	100,000
2. Mid-level	20	73,000
3. PTI LAET* with Safety	6.8	28,000
4. PTI LAET	4.2	17,000
5. PTI LAET Mid-level	1.1	3,700
6. PTI 2nd LAET	0.9	3,000

*PTI LAET - Lowest apparent effects threshold developed by PTI.